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Grinding and Finishing

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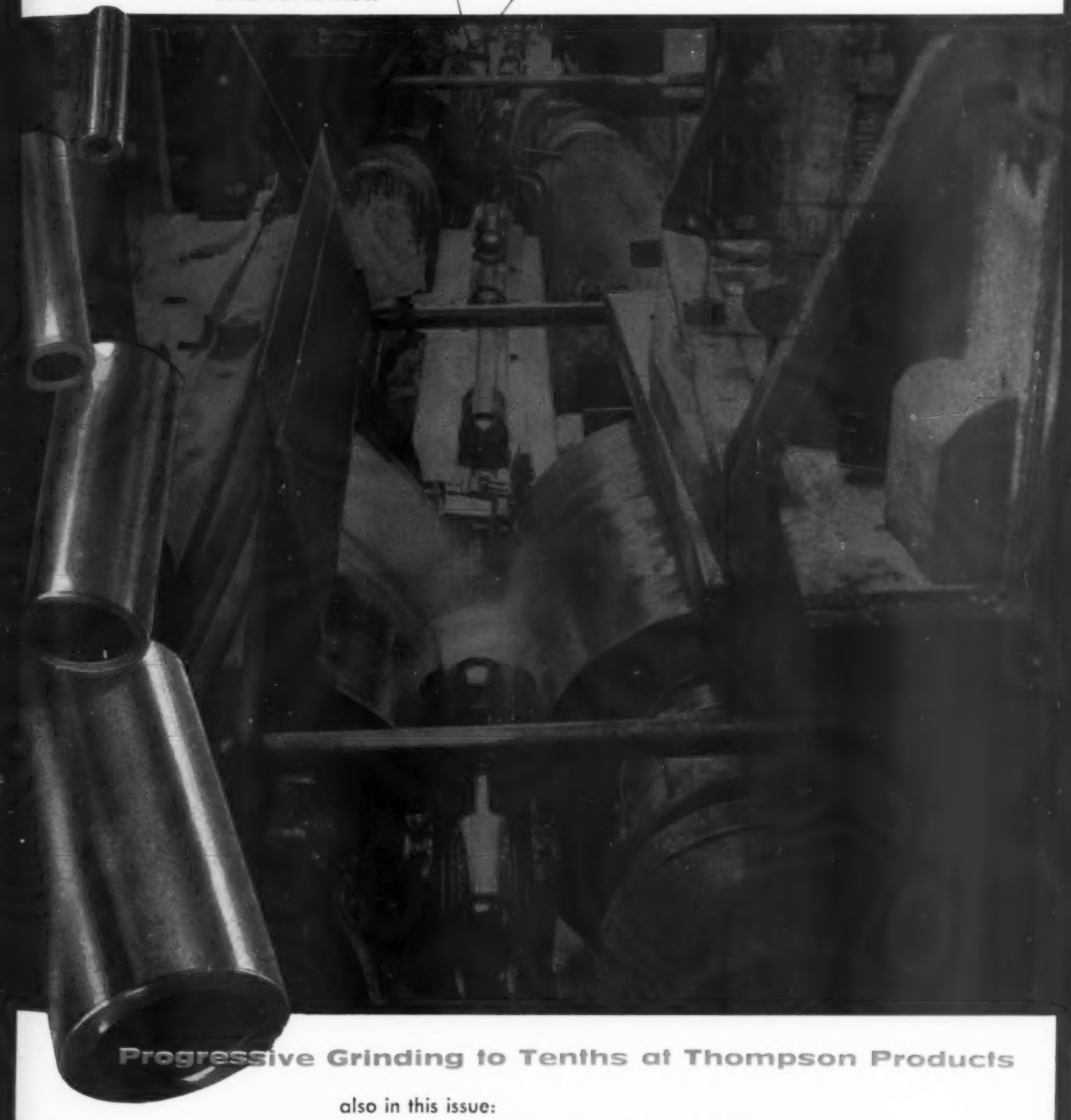


Progressive Grinding to Tenths at Thompson Products

also in this issue:

Cleaning of Grinding and Finishing Coolants—Part IV

Flap-type Coated Abrasive Wheels

Quality Control of Abrasives—Part II

hitchcock publication

june 1958

THOMPSON handles the toughest production jobs... *fast and accurately...*

with

THE VERTICAL SPINDLE SURFACE GRINDER

SPECIFICATIONS

Size: 18" x 18" x 62"
Wheel: 22" Segmental
Production: 30 blocks per hour
Total Stock Removal: .010"

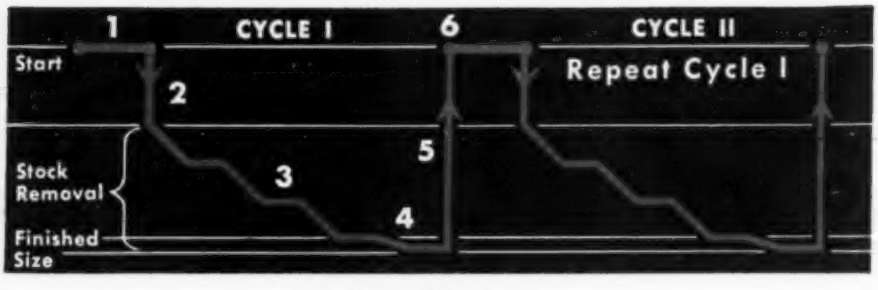
Shown above is the latest Thompson vertical spindle machine grinding the diesel engine cylinder blocks of a leading truck manufacturer. To meet the demand for fast, continuous production, both the fixture and grinding cycles are automatic and are interlocked to prevent accident. A separate hydraulic power source operates the single place fixture which locates the cylinder block on the main bearing holes.

Since any variations in stock removal would affect the compression ratio of the engines, constant accuracy is controlled throughout the grinding cycle. The operator merely sets wheel contact with the work and automatic operation begins.

Thompson vertical spindle surface grinders are made in various types and sizes to meet all job requirements. All machines of 40 inches and up in work length are equipped with the Hydra-Cool Hydraulic System*—the exclusive Thompson feature that eliminates all heat distortion throughout the machine.

*Pat. Applied For

MACHINE CYCLE (Total Stock Removal .010")



CYCLE I

1. Load work piece into fixture and start table cycle.
* 2. Manually lower grinding wheel to contact work piece.
3. Automatic downfeed of wheel occurs at each table reverse to remove .010" stock.
4. Spark out to final size with table moving to start position.
* 5. Manually elevate grinding wheel to starting position and release work piece in fixture.
6. Table automatically stops.

Can be furnished as automatic functions.

Thompson SURFACE GRINDERS

THE THOMPSON GRINDER CO.
SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

...wherever abrasive operations are performed

grinding and finishing

Contents • June 1958

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BPA

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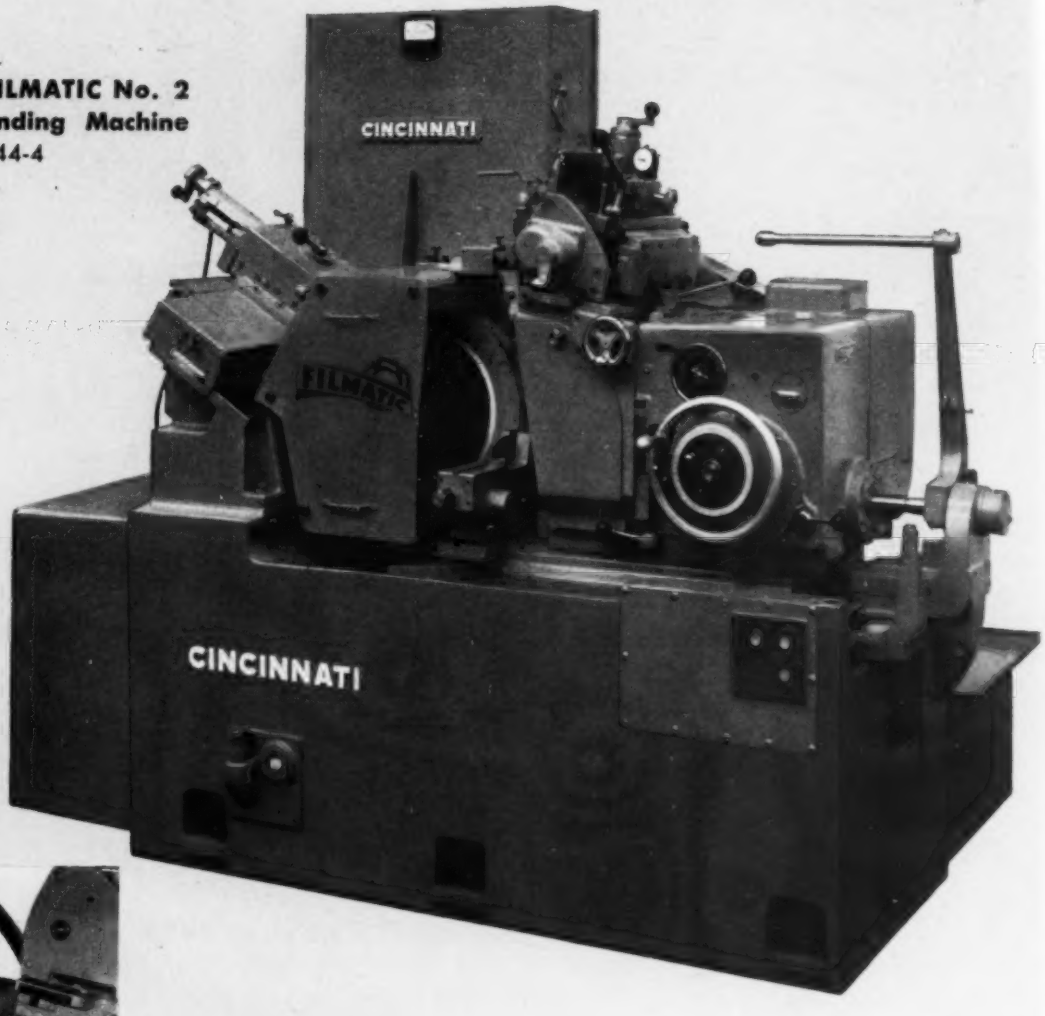
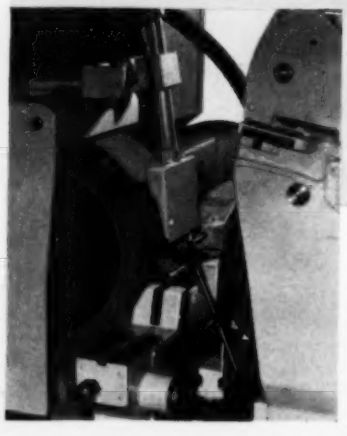
NEW FEATURES ...NEW ADVANTAGES

Incorporated in the World's Finest Centerless Grinder...

CINCINNATI FILMATIC No. 2
Centerless Grinding Machine
Catalog No. G-644-4





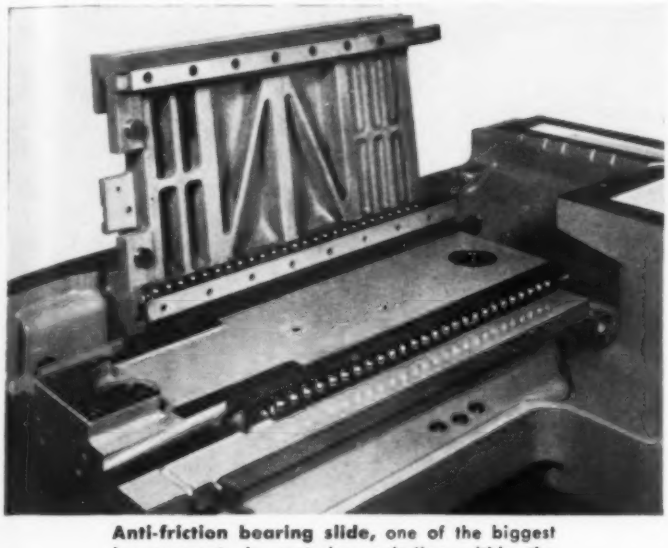
New cutting fluid control . . . the nozzle, the supporting bracket, the wheel guard . . . for more efficient use of cutting fluid. Dial indicator base (extra) for aligning workrest blade.

FILMATIC grinding wheel spindle bearings just never wear out or require adjustment.

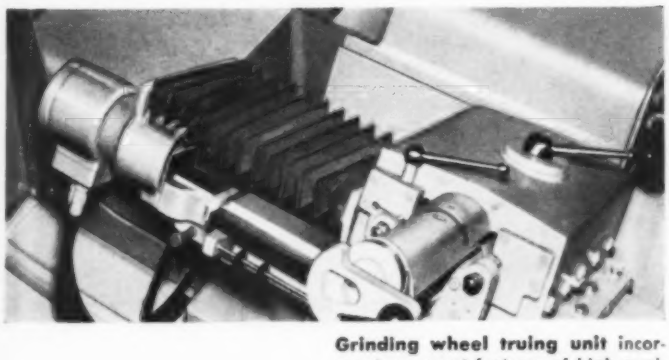
CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING
ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES

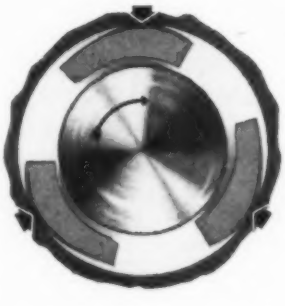
Cincinnati Filmatic no. 2



Anti-friction bearing slide, one of the biggest improvements in centerless grinding within the past few years, eliminates stick-slip and scoring.



Grinding wheel truing unit incorporates several features of high quality construction, including bellows dust guard to protect the ways and hydraulic motor to actuate the unit.



Get acquainted with the new features incorporated in CINCINNATI FILMATIC No. 2 Centerless Grinders! You'll find that these machines now have a higher cost-reducing potential than ever before. ¶For improved truing action, the grinding wheel truing unit is mounted at an angle of 30°, and controls are located directly below and at the rear of the unit, right where the operator stands when truing the wheel. To facilitate alignment of the work blade, the workrest mounting pad now has a parallel slot for a dial indicator bracket. Short operators will like the adjustable ejector limit switch*, which ejects the work when using a partial arc of infeed lever movement. Also, new cutting fluid control and nozzle for work . . . new cutting fluid control for diamond . . . bed 5" longer for ample support of new truing units . . . greater throat clearance accommodates larger regulating wheel (13" diam.) . . . both swivel adjusting screws (for correcting taper in work) located on front of machine. ¶These new features and advantages are in addition to the reliable standbys such as FILMATIC grinding wheel spindle bearings; anti-friction infeed slide; infinitely variable regulating wheel speeds, and many more. Get a copy of catalog No. G-644-4, and you'll see why CINCINNATI FILMATIC No. 2 Centerless Grinders are the finest machines available for replacement or additional equipment.

*extra with automatic ejector

CINCINNATI

MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

For information about any advertised product, see the Advertisers Index and Action Card inside back cover

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Contact your Elgin field engineer today, or write to:

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ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

Letters to the Editor

Automatic Infeed Attachments

We have read with much interest your article in the March issue of *Grinding and Finishing*, viz.: "Automatic Infeed Attachment Converts Centerless at 5% of the Cost of a New Machine."

We feel we might be able to adapt this attachment to a Gallmeyer and Livingston No. 1230 hydraulic feed O.D. and I.D. grinder.

We would appreciate it if you would forward this inquiry to Modern Devices.

We would also appreciate your opinion as to its adaptability and installation on the Gallmeyer and Livingston grinder mentioned above.

E. H. Barron
E. H. Barron & Co.
Industrial Engineers
Wilson St.
Little Ferry, N.J.

INQUIRY WAS FORWARDED.

Your article on automatic infeed attachments for centerless grinders which appeared in the March issue of your magazine interests me greatly and I am writing to compliment you on the way this material was presented, and also to ask you to forward me the address of Modern Devices who presently manufacture and sell this new Feedcision unit.

As you probably know, AIL is very deeply involved in the manufacture and sale of precision positioning equipment and the writer would like to meet with Mr. R. L. Garberding, originator of subject device, in the near future.

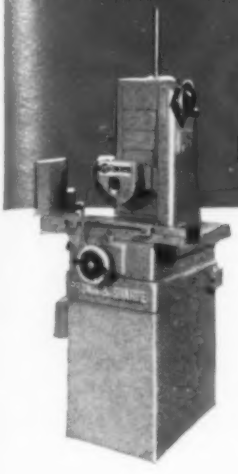
Your aid in this matter will be sincerely appreciated.

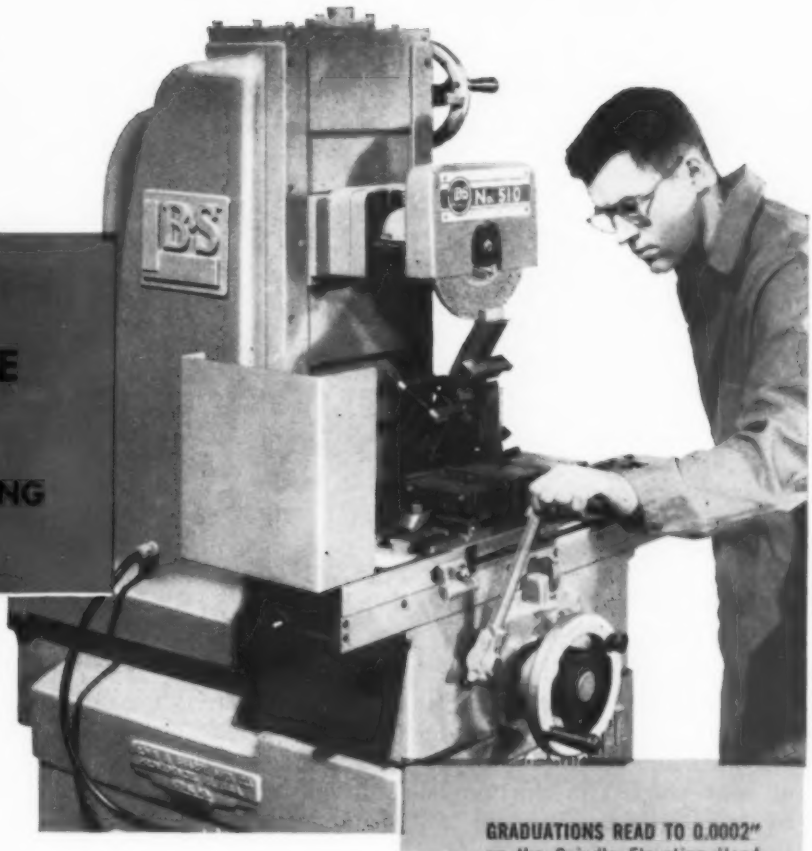
David M. Gaskill
Mgr. of Industrial Sales
Airborne Instruments Laboratory, Inc.
160 Old Country Rd.,
Mineola, N.Y.

LETTER WAS SENT ON TO MODERN DEVICES.

DESIGNED to meet today's toughest demands

THE **NEW**
BROWN & SHARPE
No. **510**
SURFACE GRINDING MACHINE



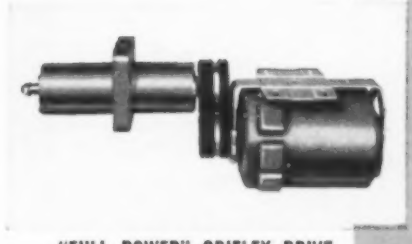


PRICED to meet today's equipment budgets

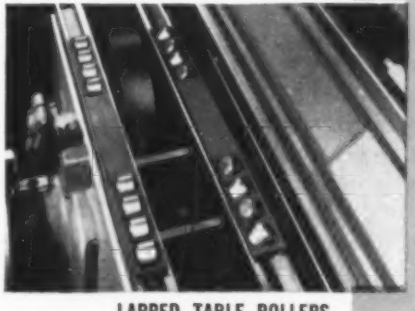
Tool and die shops, and other users of hand feed surface grinders, face increasingly tough demands today, — for high precision, for cost reduction.

The new B&S No. 510 Surface Grinder design is based on an extensive survey of these demands and needs. Add Brown & Sharpe's first-hand experience as tool manufacturing specialists, and you'll see why the new No. 510 provides the required plus in precision, work range, and efficiency.

THE LOW COST of the No. 510 is a welcome surprise to everyone who sees its many advantages demonstrated. Get details. Why settle for surface grinders of limited performance and capacity, when the same investment will buy the new No. 510? For full information, write: Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.



"FULL POWER" ORIFLEX DRIVE



LAPPED TABLE ROLLERS

"ONE SHOT" LUBRICATION

GRADUATIONS READ TO 0.0002" on the Spindle Elevating Handwheel, and on the adjustable dial of the Crossfeed Handwheel, which provides close control of transverse feed.

FULL TRAVEL TABLE OF 11" is attained by moving the Table Lever only 180°.

"ORIFLEX DRIVE" to unit-type wheel spindle (left) is through five "O rings" from 1 hp motor in vibration-free mountings. The No. 510 is also available with a direct motor drive spindle.

RUGGED, CAST IRON spindle slide, upright, and table base distribute 95% of the machines' 1225 lb. weight above the heavy gage sheet steel base. Base cabinet provides liberal storage space for accessories.

TABLE glides on precision ground and lapped straight rollers (left) forming 90° "V" and flat guide ways — permits easy, smooth operation and preserves precision alignment.

"ONE SHOT" OILER (left) lubricates entire machine by depressing plunger.

MOVABLE SPINDLE UPRIGHT for crossfeed contributes to dependable precision slot and form grinding.

CAPACITY Grinds work 11" long, 5" wide, and 12" high with 8" dia. wheel . . . 12½" high with 7" dia. wheel.

PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe B&S

MILLING, GRINDING, AND SCREW MACHINES • MACHINE TOOL ACCESSORIES • PRECISION TOOLS • HYDRAULIC PRODUCTS • CUTTERS

. . . wherever abrasive operations are performed

Grinding and Finishing Around the Country

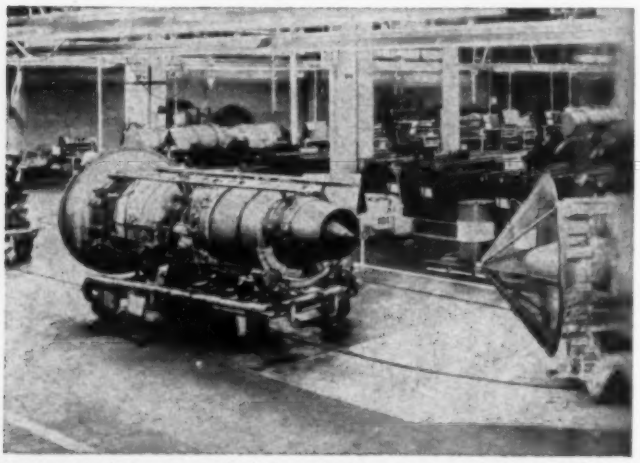
Kit Concept for Progressive Paced Processing

● The Pesco system, for jet engine service and overhaul, is designed to eliminate up to 50% of material handling normally associated with jet engine disassembly and assembly operations. Featured are use of conveyorized production line concepts. The system is available from the Automatic Warehousing Branch of Pesco Products Div., Borg-Warner Corp., 24700 N. Miles Rd., Bedford, Ohio.

Systems planning of the entire overhaul operation permits the application of assembly-line techniques based on proven basic principles. The system consists of parallel conveyorized assembly drag line and parts line. The assembly dolly and its related parts carriers travel at the same speed. Parts are grouped in "kits," each kit containing all parts necessary for complete assembly of a major component or sub-assembly.

Assembly lines are divided into stations. All tools and bulk parts for operations to be performed at a given station are readily accessible to the operator.

A variation of the system is the double-dolly line. In this system, the main sub-assembly is built up on one assembly dolly, while each component of the sub-assembly is built up on the dolly behind. •



Final assembly is conveyorized for assembly of external engine parts and test equipment.

Test Crawler Tractor Powered By High-Speed Gas Turbine

● An experimental crawler tractor, named the P-91, powered by a high-speed gas turbine, was disclosed recently by Allis-Chalmers. It is part of the company's continuous program of investigation into heat engines suitable for use as power sources in vehicles.

Inside the tractor's engine compartment, a Boeing 502-10C gas turbine power unit has replaced the conventional diesel engine. The design of the turbine involves the equivalent of a "built-in" torque converter, standard equipment on the model HD-21 crawler tractor. Ability of the turbine to deliver the range of speed and flexibility of power required will be thoroughly tested.

According to the company, exhaust gases while greater in volume have been handled in such a way as to avoid any inconvenience to the operator. •

Dun & Bradstreet's Small Business Film

● "Small Business U.S.A.—The Story of Main Street" has been released for general distribution by Dun & Bradstreet, Inc. The film was prepared for the guidance of small business management and is based on actual case histories taken from the credit files of Dun & Bradstreet, Inc. The movie script was prepared by the Public Relations Staff of Dun & Bradstreet, and the film was produced by Wilding Picture Production, Inc. at Detroit.

SIMONDS ABRASIVE CO.

NEW SA Borolon®

TRADE MARK

GRINDING WHEELS

"WE LIKE THEIR COOL CUTTING ACTION"

"CORNERS HOLD UP WELL"

"NO OTHER WHEELS RUN SO TRUE"

Superior grinding! That's the theme of these unsolicited quotes from users of Simonds SA Borolon wheels—and an indication of the efficient job these wheels are doing in toolrooms throughout industry. Their superiority is due to the single, uncrushed crystal formation of SA Borolon — enabling this unique aluminum oxide abrasive to present an uninterrupted sequence of sharp cutting edges, free from stress.

That is why these wheels provide faster grinding with heavier cuts—plus cool free action that protects expensive steels and prolongs useful tool life. For superior results use SA Borolon wheels on your grinders.

Send for bulletin ESA 272 for details, together with grain and grade specifications.

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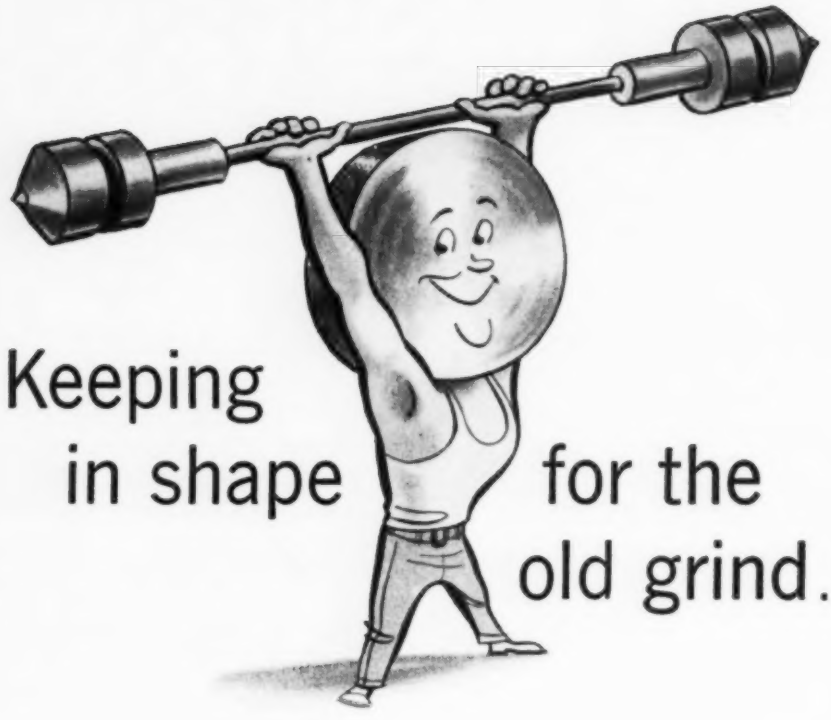


Keeping in shape for the old grind...

For more than seventy years, J. K. Smit has grown with industry, by helping industry to grow.

As abrasives were improved, and became a vital part of manufacturing, J. K. Smit developed the materials and techniques necessary to make the tools to true and dress abrasive wheels.

Today, J. K. Smit produces quality diamond tools for trueing, dressing, and contouring every type of abrasive wheel ...For doing the jobs too tough to be done economically by anything but industrial diamonds.

J. K. Smit field engineers are as close as your telephone for consultation on any diamond tool problem.

For details on the very best in diamond tools, call or write direct for our latest catalog.

SUPER MATERIAM IGNIS TRIUMPHANS

J. K. Smit & Sons, Inc.

MURRAY HILL, NEW JERSEY

DETROIT, MICH.

Grinding and Finishing Around the Country

• The film presents the different situations behind store fronts. It illustrates the problems faced, how they are surmounted, and when they are not.

The 30-minute film is available at a rental fee of $2.75. Ideal Pictures, Inc., 58 E. South Water St., Chicago 1, has distribution rights.•

Plan Plant's Fire Protection

• Could a Fire Ruin Your Business? is the question posed by the Research Institute of America, Inc., in a recent *Report to Management* (File 33) made to its executive members. ". . . New materials, processes, and out-of-the-way locations have multiplied industrial fire hazards, calling for basic re-examination of fire protection planning." •

Sun Bathers' Beach Kept Intact

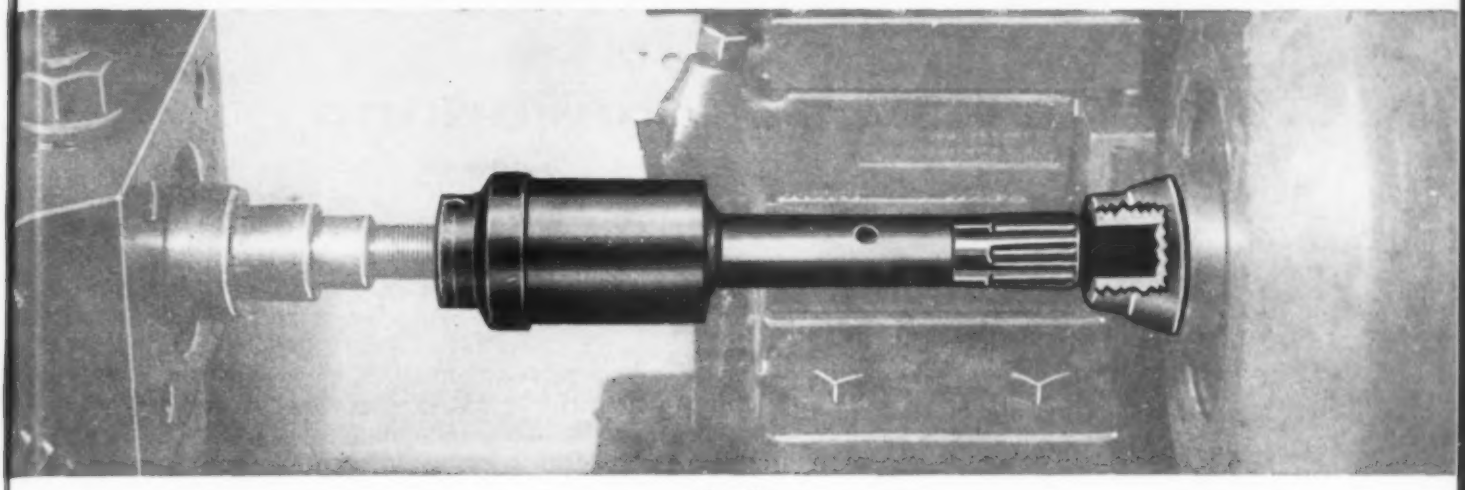
• An 800′ length of sand discharge hose has been laid across the bottom of Lake Worth Inlet at Palm Beach, Fla., to keep a sun bathers' beach in place. The Goodyear Tire & Rubber Co., maker of the 10″ wire reinforced hose, reports it is being used to pump sand to a bathing beach section of Palm Beach that is disappearing rapidly with outgoing tides. •

YOUR QUESTIONS ANSWERED!

Send your questions and problems to GRINDING and FINISHING. Your problems may be similar to many others so let's get them out in the open. Our new question and answer section will attempt to answer the bothersome detail problems as well as the major difficulties. Please include all the facts involved in your question.

from 125 to 5 micro-inches *surface finish*

in one 5-second pass!



with the revolutionary Microller burnishing tool

- Finishes roughest bored or turned surfaces (ie: 200 mu-in. and higher) to finishes of 4 micro inches and lower.
- Finishes in one pass at feed rates of 8 to 12 inches per minute. A one inch length in 5 seconds!
- Finishes all machineable metals . . . all types of surfaces; internal and external cylindrical . . . tapered, radial, flat.

ADJUSTABLE FOR SIZE CONTROL

- Sizes in increments of .000025" or less . . . performs sizing operations never before possible. Invaluable for sizing bearing seats, oilite bushings, parts out of tolerance, etc.
- *Run thousands of parts without tool wear.* No stones to replace. Highly hardened rolls and tip last for thousands of parts. Tool maintains size setting . . . no adjustment necessary. Wearing parts replaceable. Simplest setup and operation . . . no skill required.
- *Stock shipment in popular sizes.* Tools and replacement parts available from stock for off-the-shelf delivery.
- *Refined, improved surface, a new concept.* Tool marks and surface imperfections are *rolled* out. Grain structure is condensed and compacted . . . work-hardened and refined; fatigue properties are improved. An ideal, wear-resistant, surface results . . . free of damaging abrasive grit inherent in honing or grinding.
- The top twenty companies in the metal working field . . . plus more than a thousand others have replaced costly finishing and sizing methods with the Microller burnishing tool. In actual case histories, finishing costs have been cut by 90% . . . production rates increased by eight and nine times.
- *Results guaranteed:* The Microller is backed by Madison-Faessler's 80 years of experience in producing cold rolling tools . . . and is sold on a results guaranteed basis. Sales and service representatives in all principal cities.
- *For additional information write today to*

(Affiliated with Madison Industries)

MADISON-FAESSLER TOOL CO.
235 N. Fifth St. Moberly, Mo.

use tool in any machine!

No special equipment needed. Use the Microller in any of your present machines . . . on a drill press, engine or turret lathe as a secondary operation . . . or right on the screw machine or automatic where the other operations are performed!

AVERAGE TOOL COSTS LESS THAN $190.00

. . . wherever abrasive operations are performed

News of Metalworking

Transmission Fluid

DETROIT: More than half the automobiles on the road have automatic transmissions, and by 1965 this proportion may rise to 80%. Automatic drives were extremely complex in their development. There is quite a history to the perfection of automatic transmission fluids also.

AQ-ATF is the number embossed on sealed can tops of qualified transmission fluids. Recalling the background of the number dating back to 1937, when the fluid used was mineral oil, was Norman A. Hunstad of General Motors Research Staff, before the Society of Automotive Engineers.

Although there had been more or less feeble efforts at the development of the fluid up to 1949, the decision was then made by General Motors management to set up a procedure to insure satisfactory fluids. There had been complaints from car owners because of inadequate fluids. Today the AQ in the qualification number embossed on the fluid cans is an abbreviation for Armour Qualification. ATF stands for Automatic Transmission Fluid, and the qualification number designates the particular petroleum company brand that has rated approval. •

Utah Smelter Changes Hands

NEW YORK: American Smelting and Refining Co. and Kennecott Copper Corp. have agreed upon the sale by ASARCO to Kennecott Copper Corp. of the former's Garfield Copper Smelter near Salt Lake City, Utah. The price will be approximately $20,000,000 in cash and will include inventories of materials and supplies, adjacent real estate and certain other assets of the smelter.

The actual transfer of title is not expected to take place until January 2, 1959, with Kennecott taking over operation at that time. No change will be made in the jointly-owned Garfield Chemical and Manufacturing Corp., a large producer of sulfuric acid from smelter gases. •

Profit for Allegheny Ludlum

PITTSBURGH: Allegheny Ludlum Steel Corp. announced its earnings for the first quarter of 1958 were $725,900. Total sales for that period were $50,454,925.

"The most significant thing about our first quarter is that we were able to show a modest profit in spite of the sharply reduced level of operations," E. J. Hanley, president, stated. This was possible, he added, because of lower raw materials costs, improved operating efficiency attained in part by installation of new mill equipment and cost reductions made in the company's plants and offices. •

Acme Steel Reports

CHICAGO: At the annual meeting of Acme Steel Co., Chicago, it was reported that consolidated sales for the first quarter were $28,535,962, as compared to $31,426,543 for the fourth quarter of 1957.

Although there was a decline in earnings, Guy T. Avery, president, reported a few bright spots as "the Howell Division, where sales of modern metal furniture last year were at an all-time high, and our Dexion Slotted Angle Division reports a continuing increase in sales for this product." •

Olin Mathieson Report

NEW YORK: Sales and operating revenues of Olin Mathieson Chemical Corp. in the United States and Canada in the first quarter of 1958 were $127,625,000, a decline of 6% from the first quarter of last year. Net profits were $4,473,000, or 33 cents per share. Decrease in profits for the first quarter was accounted for by charges to income for activities not directly connected with regular operations.

The corporation's aluminum rolling mill at Omal, Ohio, has begun operations on a limited basis while construction is still in progress. The Ormet Corp. alumina plant in Burnside, La., and the first pot line of the aluminum reduction plant at the Ohio site will both start production in May. All units of the corporation's aluminum development should become fully operative by the beginning of 1959. •

Controls Co. Sales

SCHILLER PARK, ILL.: Sales of Controls Co. of America (manufacturer of controls for aircraft, heating and appliance industries) were $6,308,342 in the three months ended March 31, compared with $7,345,454 in the first quarter of 1957. Earnings were $206,446 after income tax provisions.

Louis Putze, president, pointed out that the latest three month earnings included a non-recurring gain of $93,275 on the sale of a plant at Spring Valley, Ill. The Spring Valley operations were transferred to a newly constructed plant at North Manchester, Ind. •

Eastern Stainless Steel

BALTIMORE, MD: Revenues of Eastern Stainless Steel Corp., Baltimore, and its marketing subsidiary, Industrial Stainless Steels, Inc., of Cambridge, Mass., were off for the first quarter of 1958. This followed a pattern throughout the industry, according to John M. Curley, president of the company, who added that a marked upturn in customer ordering volume during the quarter is expected to improve Eastern's earnings and sales picture during the second period of 1958.

Eastern Stainless showed a consolidated net profit through March 31 of $249,001 this year on sales of $9,675,201. •

"The Tool & Die Makers Surface Grinder"

Harig's NEW TML 6x12 SURFACE GRINDER

THE NEW TML BY HARIG PROVIDES EXTREMELY FAST AND ACCURATE GRINDING—STURDY CONSTRUCTION—ADVANCED DESIGN WITH ECONOMY IN MIND. . . *THE LOW COST WILL PLEASE YOU!*

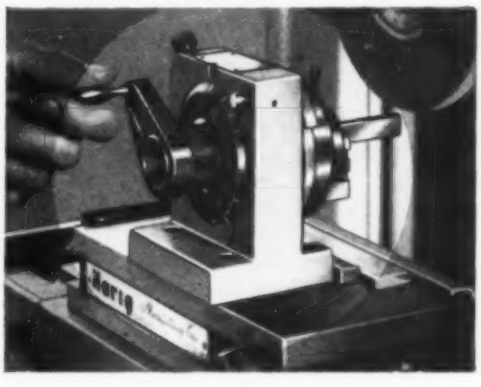
OUTSTANDING FEATURES

- Solid one piece construction of spindle housing and vertical slide.
- Elevating screw centrally mounted.
- Combination "V" and flat ways assure positive alignment.
- Angular rack and pinion mounting distributes wear equally along rack and pinion face.
- Motorized Spindle, dust collector and water unit available.

SPECIFICATIONS

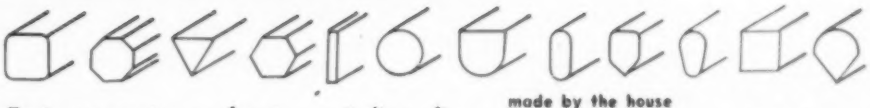
Longitudinal Travel	12-3/8"
Cross Feed Travel	7"
Vertical Working Height (Under 7" dia. wheel)	0" to 12-3/4"
Platen Working Area	6" x 12"
Grinding Wheel	7" x 1/2" x 1-1/4"
Elevator Handwheel Graduation	.0005
Cross Feed Handwheel Graduation	.001

Remember: Harig's Famous Precision is in Evidence Throughout!



Harig's IMPROVED Grind-All FIXTURE

"The Latest Advancement in Perforator Grinding"



Fast, accurate perforator grinding fixture — hand crank for easy rotation of index plate, single locking screw for making quick set-ups. Easily grinds irregular shaped perforators concentric with shank within ±.0002 accuracy. Also can be used as milling, boring and inspection fixture. NEW! RADIUS DRESSER ARM—attachment makes Grind-All Fixture a highly accurate radius dresser.

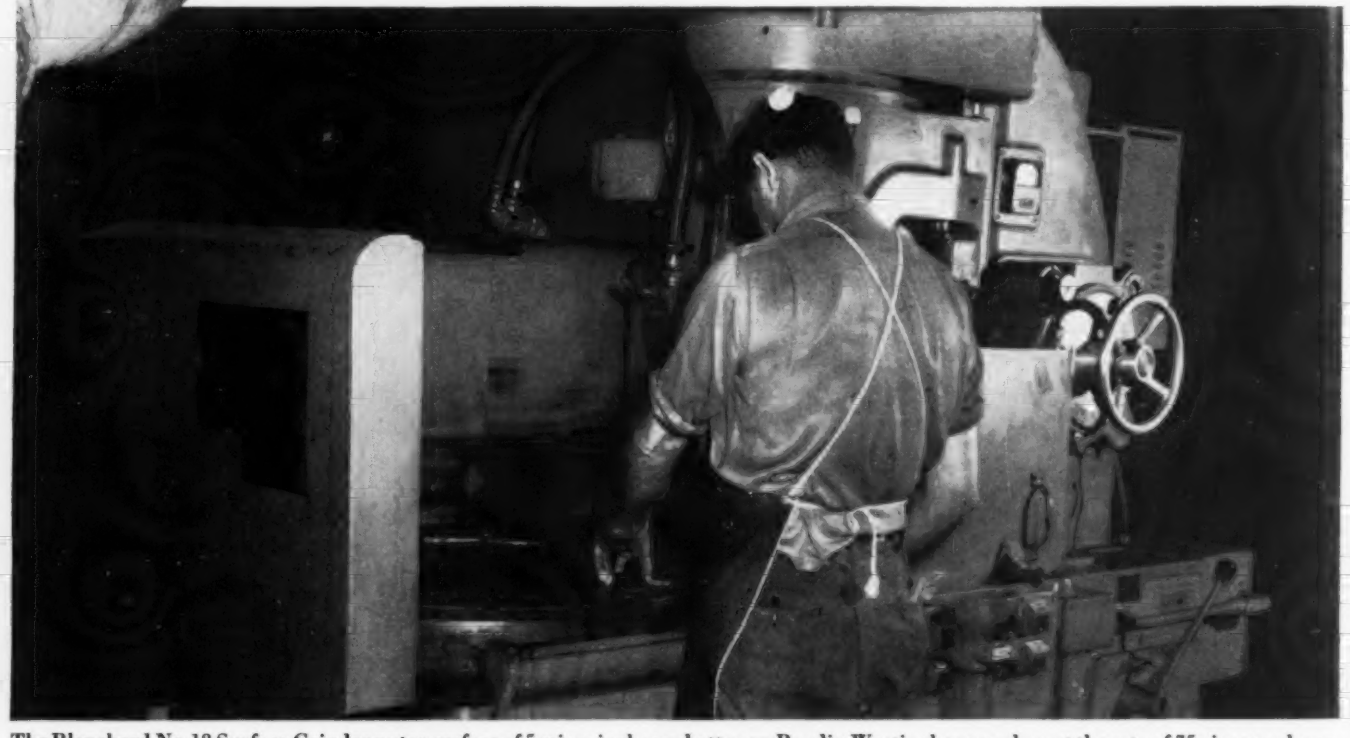
made by the house that precision built!

Harig Manufacturing Corp

5769 W. Howard St. - Chicago 31, Ill.

This valve gets a leak-proof seal from a Blanchard Surface Grinder

"The Blanchard Surface Grinder is one of the most important improvements in our modernization program." This report comes from the Commercial Refrigeration Division of Bendix-Westinghouse Automotive Air Brake Company—makers of power and condensing units for refrigeration equipment.



The Blanchard No. 18 Surface Grinder puts a surface of 5 micro inches or better on Bendix-Westinghouse valves at the rate of 75 pieces an hour.

A Blanchard Model 18 Surface Grinder is used to finish grind valve plates used in Bendix-Westinghouse electric refrigeration compressors. They say: "This operation is very important, because—with a surface finish of five micro inches or better—we get a perfect seal on our gaskets and valves, eliminating the possibility of leakage."

Is there room for improvement in *your* surface grinding? For best results...

PUT IT ON THE BLANCHARD

Write today for your free copy of "Work done on the Blanchard," fifth edition, and "The Art of Blanchard Surface Grinding," fourth edition.

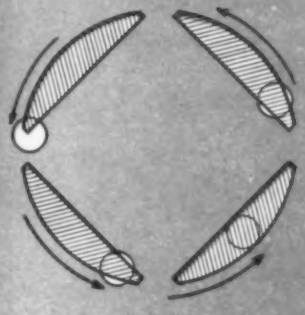
THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

Obtain "Arc-line" Shearing Action with

CORTLAND SHAPE SEGMENTS and CHUCKS

for Better Surface Grinding

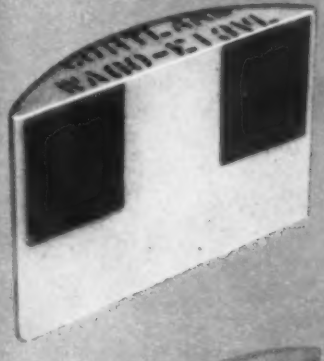


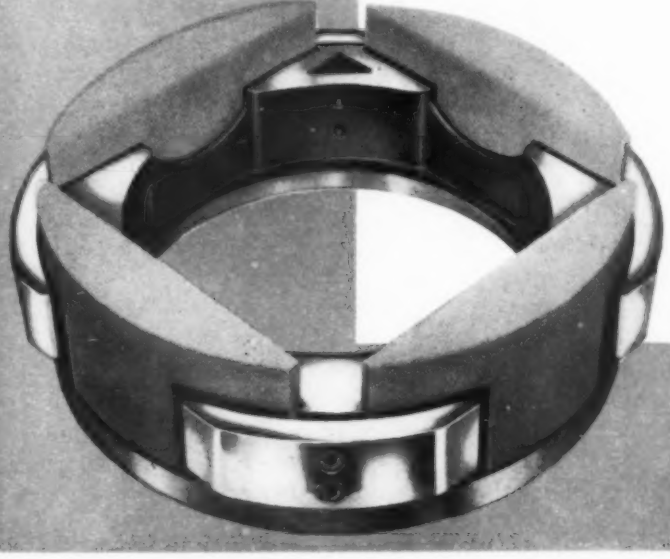
The outer edge of the grinding face of each Cortland segment is a true arc, but the inner edge is a straight line. This combination of *arc* and *line* results in superior grinding action, because the grinding area is narrow at each end and wide in the center. Thus, the arc-line shape of the Cortland segment acts to remove stock with a continuously varying area of contact between work and segment.

As illustrated in the diagram at left, the narrow leading wedge of the segment acts as a plow and the straight inner edge traveling diagonally across the work surface produces a powerful shearing action. This combination of plow and shear action tends to decrease loading, helps chip removal.

These variable areas of contact result in uniform grinding of the entire surface with less pressure on the work and less distortion; and combine with the action of the coolant to reduce heat generation. All this results in higher rate of stock removal, with better finishes to closer tolerances.

Cortland "Arc-line" Segments and Chucks are available in a wide range of sizes with segments in standard and special combinations of abrasive and bond. Write for bulletin and state make and model of grinding machine.





CORTLAND
GRINDING WHEELS
CORPORATION
Chester, Massachusetts

CORTLAND

. . . wherever abrasive operations are performed

Letter From Washington

By **D. M. Carlson** . . . . June 1958

Beware of a distortion of values, Dulles cautions.

• Secretary of State John Foster Dulles, speaking before the Military Chaplains Association of the U.S.A., stressed the need for seeking spiritual things first, letting material blessings be a byproduct, not the primary goal of our lives. "It is of the greatest importance to bear that distinction in mind as we face the challenge of an atheistic society which avowedly puts first the search for material things," he warned. "The American people are naturally competitive, and that is a good thing. . . . We need at times to be jolted into realization of the fact that our leadership in any field is not automatic. It requires effort and sacrifice. We have need today for greater endeavor and greater sacrifice. But also there is need to be careful lest, in a purely competitive spirit, we be swept away from our basic spiritual moorings. We must not put first such material successes as are the goals of Soviet communism."

Pension, welfare, profit-sharing bill is passed by Senate, sent to House.

• The Senate has unanimously passed the Douglas bill and sent it to the House for further action. Here is what the bill would require: (1) registration of those in charge of managing the pension, profit-sharing, or welfare plan; (2) reporting of payments, receipts, assets, liabilities, etc.; (3) availability of registration or report material for public inspection; (4) administration by Secretary of Labor; (5) continuation of operative term for four years from date of enactment. Practically all such employee plans would be affected by this bill. Failure to comply would be punishable by fines or imprisonment.

Sherman Anti-Trust Act should apply to unions as well as business, Chamber of Commerce maintains.

• The National Chamber of Commerce has proposed to Congress curbs on union power that include placing unions under the anti-monopoly laws which apply to all other elements of the community. The Chamber's view was presented by Robert G. Kelly, a Charleston lawyer, at hearings before the Senate Labor Subcommittee on proposals to correct union abuses. "Unrestrained union monopolistic power was nurtured by the Federal Government," he said. "Congress and Congress alone can control union power. . . . It should remedy abuses of power by striking not at the symptoms but at the causes, not at the branches but at the roots." Besides application of the anti-trust laws, Kelly recommended these restraints on union power: prohibition of compulsory union membership, strengthening of state authority to deal with labor problems, prohibition of recognition and organizational picketing, and closing of secondary boycott loopholes.

Private power development championed by members of Atomic Energy Commission.

• The Administration is taking a firm stand for private development of atomic power. Representatives of the Atomic Energy Commission have asked Congress for approval of atomic construction projects that include a $50-million reactor to be constructed by private firms. The government would go ahead on its own only if private firms declined the opportunity to participate. Strong opposition is expected from public power advocates and from within the Congressional Joint Atomic Energy Committee.

CDP is a registered trade mark of Koebel Diamond Tool Co.

"What a difference CDP* makes"

Over and over we hear this from people after they try (and then standardize on) KOEBEL CDP* dressing tools for grinders.

CDP* tools are different—IN ECONOMY

- you use up every point and piece of every diamond particle.
- there is no wastage. CDP* gives the most efficient use of diamond caratage conceivable.
- you eliminate diamond resetting.
- you get more pieces per dressing.
- longer wheel life cuts wheel costs.
- you cut diamond tool costs (see example).

CDP* tools are different—IN PERFORMANCE

- there's a big difference in results (see typical example).
- they even do jobs big single diamonds can't do efficiently.
- they take the guesswork out of diamond performance by insuring *uniform* results, tool after tool.

Yes, CDP* tools are different

- there is no quality variation in CDP* dressing tools.
- it is their design and manufacturing uniformity that gives you such uniform results.

CDP* – Cemented diamond particles—small diamond particles set into a matrix which automatically adjusts itself to diamond wear.

A typical wheel dressing example

	Single Diamond	CDP* Dresser
Life	5 days	60 days
pcs/dressing	12	25
cost/100 pcs.	1.7 cents	0.5 cents

(¼ the tool cost per piece, half the wheel cost, less downtime and double the wheel life.)

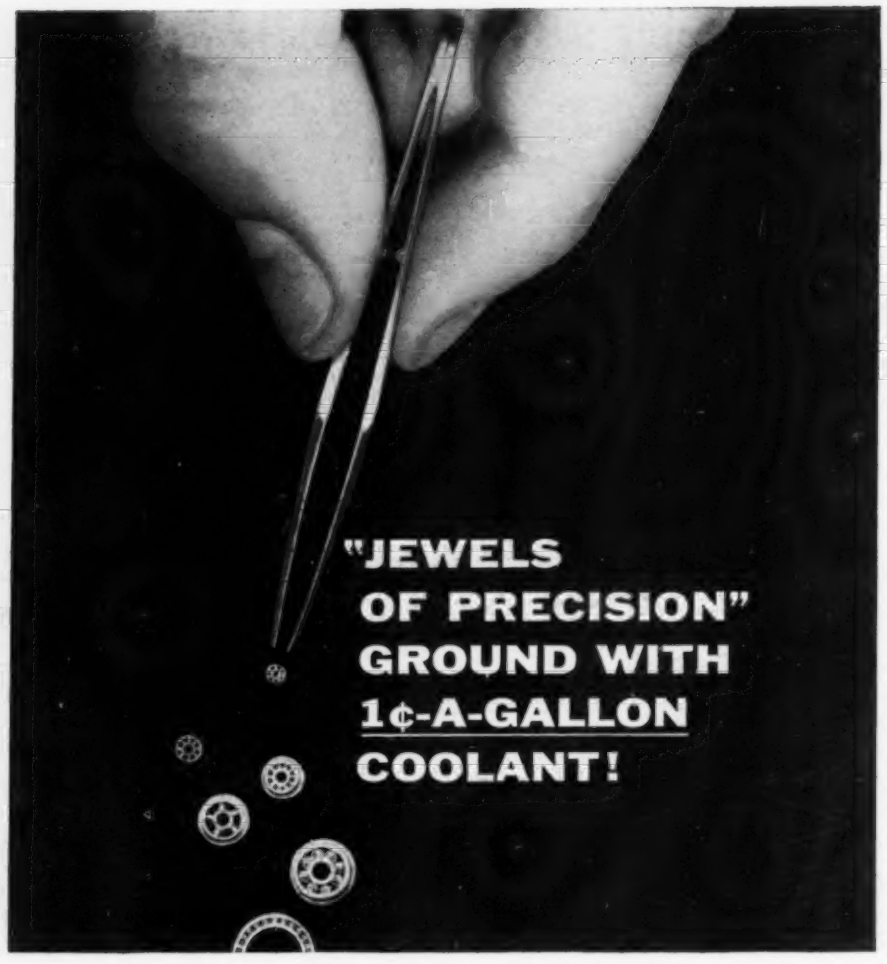
CDP* tools take the guesswork out of diamond tools and convert them into WORKHORSES OF INDUSTRY. What carbides did for machining, CDP* tools are now doing for grinding.

Ask for Bulletin #356

KOEBEL DIAMOND TOOL CO.

9456 GRINNELL • DETROIT 13, MICHIGAN

CDP DRESSING TOOLS—SINGLE & MULTIPLE DIAMOND DRESSING TOOLS—CDP CUTTERS



"We feel that White and Bagley 1500 is the best grinding liquid we have found!"

— Miniature Precision Bearings, Inc.

Machining of ball bearing assemblies so tiny that 500 can fit in a thimble is everyday routine at Miniature Precision Bearings, Inc., Keene, N. H. For such exacting work as precision grinding of tiny bearing races, W&B Grinding Concentrate 1500 is specified.

This entirely different type of coolant is normally diluted 1 part concentrate to 150 to 200 parts water. A 55-gallon drum of W&B 1500 provides up to 11,000 gallons of coolant — *at a cost of only 1¢ a gallon!*

Coolant made with W&B 1500 is transparent, and foamless as water. It provides excellent rust protection. Grinding is keener . . . machines stay cleaner. Chips settle almost instantly.

Mail the coupon for complete information about this outstanding coolant concentrate, being used by many of the country's largest manufacturers.

W+B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.
Worcester, Massachusetts • Detroit, Michigan
Originators of Grinding Lubricants

Sulphurized Fatty Bases
Grinding Coolants and Lubricants
Cutting, Grinding and Honing Oils
Forging Compounds

THE WHITE & BAGLEY CO., 88 Foster St., Worcester, Mass.

Please send me complete information on W&B Grinding Concentrate 1500.

NAME ..... TITLE .....
COMPANY ..... STREET .....
CITY ..... ZONE ..... STATE .....

☐ My plant has a tricky grinding problem on which we'd like advice. I've attached a letter describing it in detail. I understand that you offer this service without obligation.

Letter From Washington . . .

Ike Will Support GOPers Who Favor His Three "Musts"

In carefully chosen words, President Eisenhower has issued a mild warning that he will actively support for re-election only those Republican legislators who will vote for his programs of defense reorganization, reciprocal trade extension, and foreign aid. Some GOP senators and representatives were angered by the gentle "ultimatum."

First public evidence of Republican dissatisfaction came in a minority report on the $3.6 billion foreign aid authorization which had been approved by the House Foreign Affairs Committee. Four Republicans and one Democrat declared that our tax dollars distributed abroad "have purchased neither friends nor the desired security." They recommended that Congress drastically reduce such expenditures in order to compel the Administration to re-evaluate its foreign spending program. Actual appropriations are expected to be cut by as much as $500 million—largely through Republican intervention.

The President's reciprocal trade extension proposal is most strongly opposed by leading Republicans, two of which are Rep. Daniel A. Reed (R. N.Y.) and Rep. Richard A. Simpson (R. Pa.) Instead of the five year extension sought by the White House, the most that can be expected is one or two years.

The Administration's bill to lower tariffs 25% to 30% below current levels is almost certain to be defeated, an opinion that is shared by GOP Minority Leader Joseph Martin (Mass.).

LeTourneau Urges Conservation Measures

Robert G. LeTourneau, sometimes called "dean of earthmoving," recently came to the defense of U.S. money being devoted to flood control and development of the nation's waterways.

In an address before the annual Rivers and Harbors Congress, he called for more government spending in those fields. He also recommended the building of a sea-level isthmus canal to replace the present lock-system Panama Canal. • • •

Jack O'Sullivan's new grinding technique cuts costs and back-aches—(Bay State distributor Jack O'Sullivan of Engineered Sales Co., Summit, N. J.)

Jim Frederick proved that 1 wheel could out-perform 3 at Steelcraft Tool Co.—(Bay State distributor Jim Frederick of Industrial Abrasives Co., Detroit)

Better grinding at lower cost...

that is their business

Vic Ericson helped make 1 wheel do the work of 12 at Whitin Machine Works. (Bay State distributor Vic Ericson of Johnson deVou, Inc., Worcester, Mass.)

Earl Singleton cut the costs of grinding heavy traction gears—(Bay State distributor Earl Singleton of Browning Tool & Supply Co., Indianapolis)

Bun Walker
on roll grindin
engineer Bun W

The Bay State
typical represe
that has built u
out cost-cuttin
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who puts servi
fill out the car

BAY STATE
WHEELS of PROGRESS

BAY STA
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Don Kennedy cut snagging costs at a large East Coast shipyard. (Bay State abrasive engineer Don Kennedy)

Jim Lewis put one wheel to work on *two* machines! (Bay State distributor Jim Lewis of Lewis Sales Co., Cleveland)

Bun Walker is an expert's expert on roll grinding. (Bay State abrasive engineer Bun Walker)

John Martin beat his own best cut-off wheel by 50% – (Bay State distributor John F. Martin of Mau-Sherwood Supply Co., Cleveland)

The Bay State men shown on these two pages are typical representatives of a field organization that has built up a unique reputation for working out cost-cutting solutions to grinding problems.

Like these men, your own Bay State representative is a thoroughly trained abrasive specialist who puts service before salesmanship. Why not fill out the card at right and see for yourself?

ATE
IVES

Mr. Elden L. Auker, Vice-President
Bay State Abrasive Products Co.
Westboro, Massachusetts

Dear Mr. Auker:

I would like to have one of your abrasive engineers call on me. I understand there is no obligation.

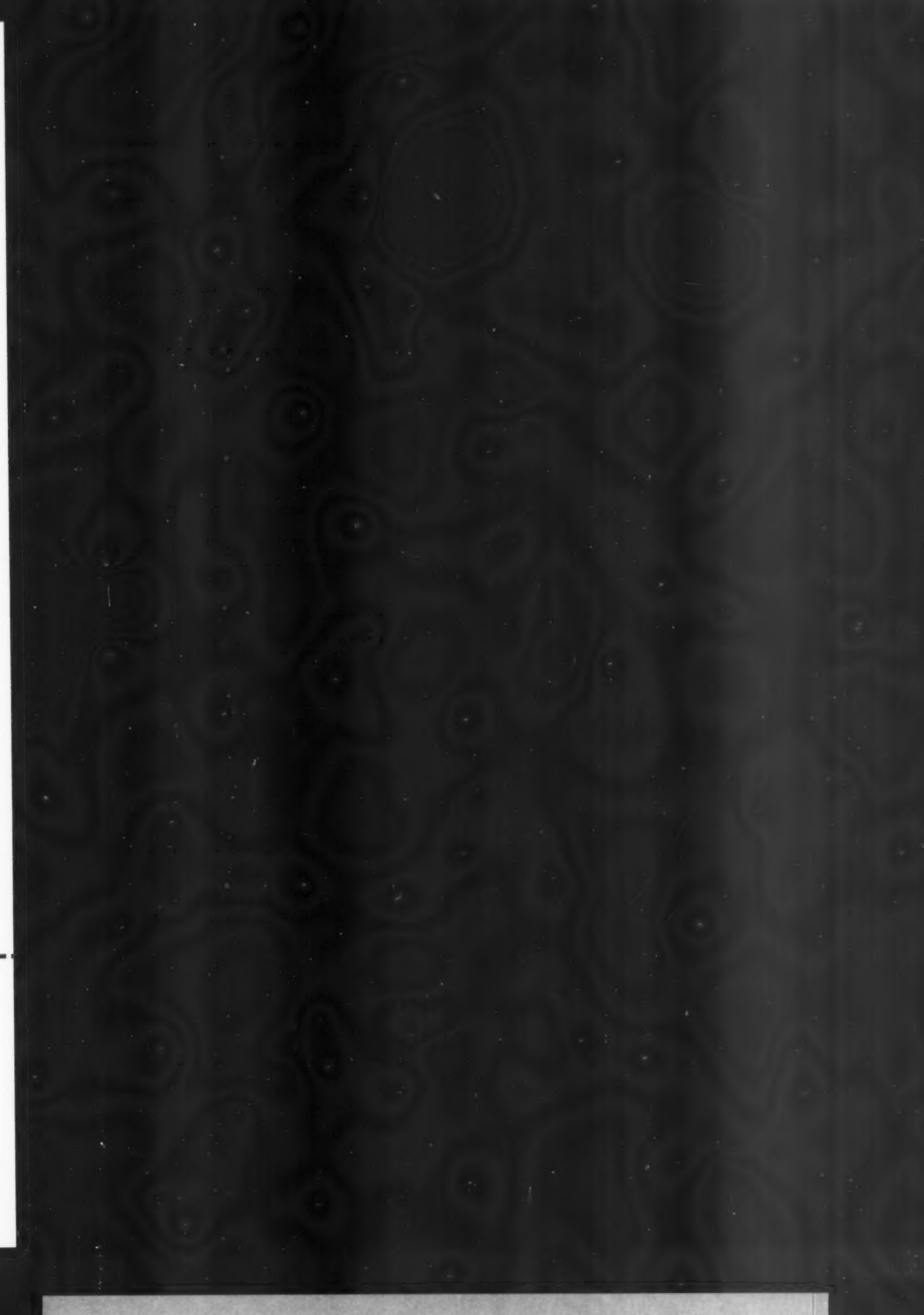
Name_____

Title_____

Company Name_____

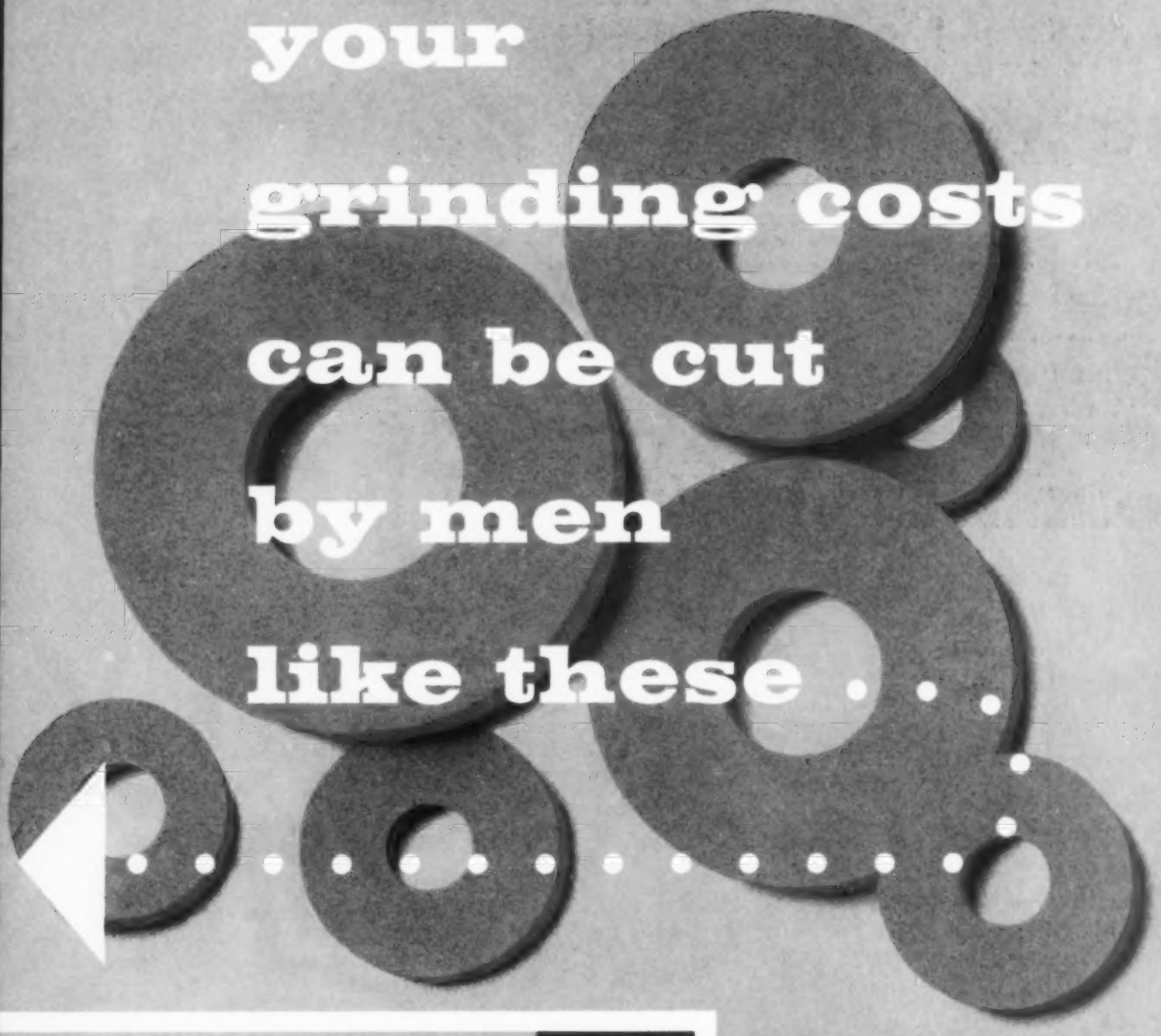
Address_____

City_____ State_____



10 to 1

your grinding costs can be cut by men like these . . .



FIRST CLASS
Permit No. 2
Westboro, Mass.

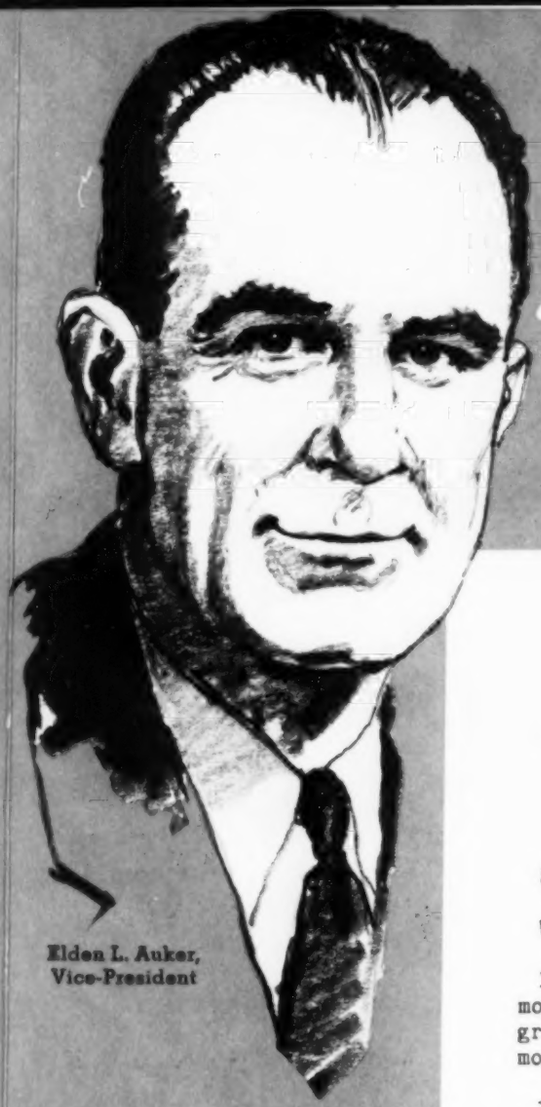
BUSINESS REPLY CARD

No postage stamp necessary if mailed in the United States

—POSTAGE WILL BE PAID BY—

MR. ELDEN L. AUKER, Vice-President
BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO,
MASSACHUSETTS

Why not let a Bay State abrasive engineer study your grinding problems? Just fill out and mail this card and he will call.



Elden L. Auker,
Vice-President

"We want your toughest grinding problems..."

ESTABLISHED 1928
BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS COMPANY

WESTBORO, MASSACHUSETTS U.S.A.
TELEPHONE WESTBORO FOREST 8-4433

Some people don't like to be called eager beavers.

We do. In fact, we're proud of it.

It's one reason why we devote so much time, effort and money to research and development . . . why our company has grown so fast and why we have been able to expand, modernize and remodernize our plants year after year.

It's also one reason why our field representatives are not only experienced and hard-working salesmen . . . but also genuine experts on grinding problems. They know their grinding wheels, of course . . . but they also know when to look beyond the wheel to solve the basic grinding problem.

That's why we feature our distributors and our company representatives in our advertising. We believe that the quality of Bay State products added to the knowledge and experience of men like those shown on the preceding pages make a combination that's rarely equalled, never surpassed.

How about letting us prove it?

Just fill in the enclosed card and mail it to me. We'll show you mighty quick what happens when you combine the best abrasive wheels on the market with real abrasive engineering service. No obligation, of course.

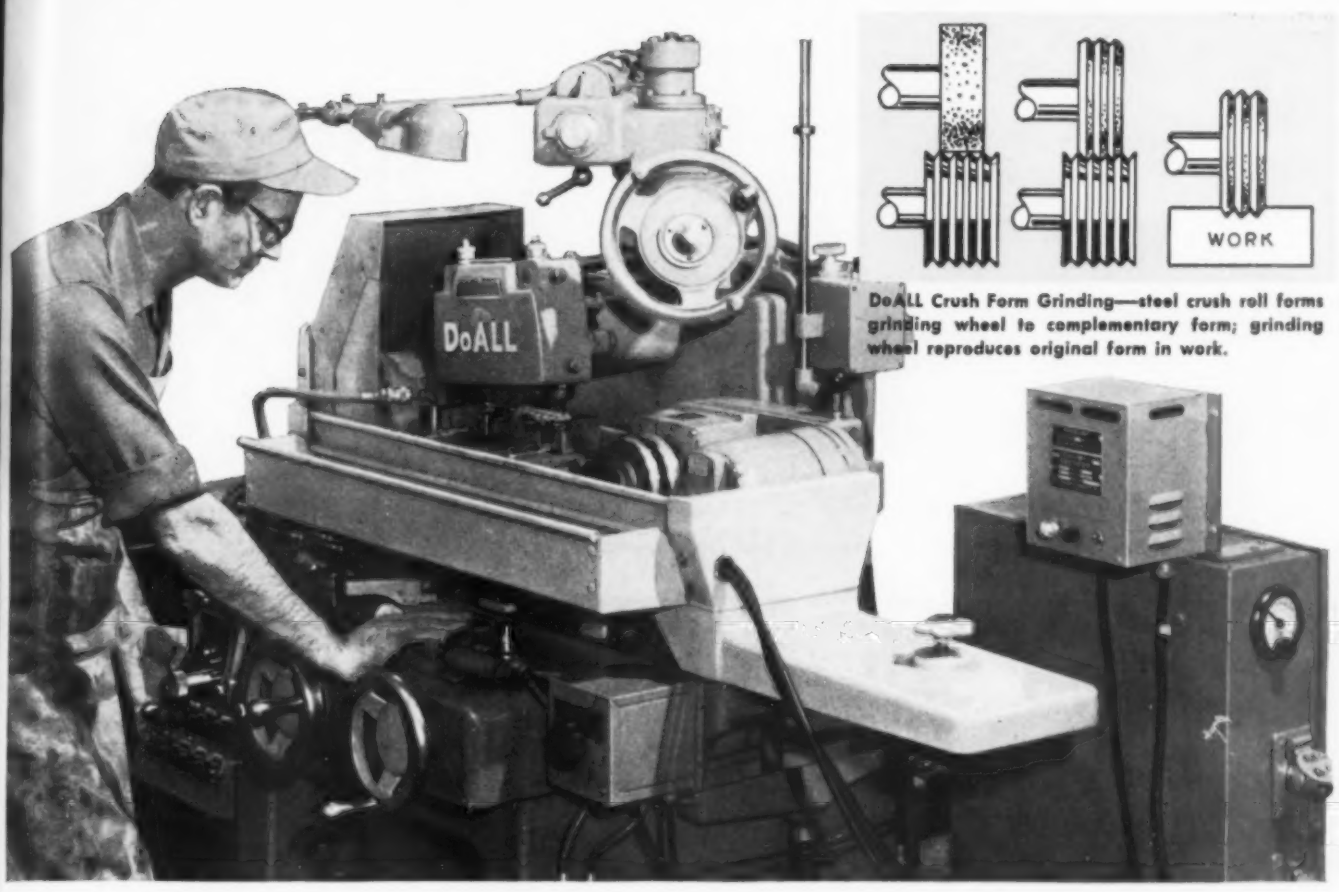
Sincerely,

Elden L. Auker

Elden L. Auker
Vice-President

BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVES



DoALL Crush Form Grinding—steel crush roll forms grinding wheel to complementary form; grinding wheel reproduces original form in work.

MARCHANT CALCULATOR *finds an Answer with* DoALL CRUSH FORM GRINDING

Marchant DECI•MAGIC calculator and workpiece (inset) —a division control gate hardened to .020" with surface reading of 52 to 56 Rockwell "C", then cadmium plated prior to grinding.

There may be a valuable idea for you in the way The Marchant Calculator Company, Oakland, Calif., solved a complex radius-grinding problem on the control gate fingers of their DECI • MAGIC—a modern calculator that performs division in record time.

Previously, the radius was ground by rotating one finger at a time under a straight dressed grinding wheel. The wheel ran dry because the operator had to see the radius to determine how much stock to remove. The result of this hand operation was unavoidable variation on all 11 fingers. Still worse, an unwanted radius was generated .015" back of the finger tips—impossible to remove because of insufficient stock.

Installing a DoALL Crush Form Surface Grinder eliminated the problem entirely. The DoALL Grinder automatically controls the radius to within .0005", and holds total accumulative tolerance to .001". And with DoALL Cool Grinding (fed through the wheel) plus flood coolant, surface finish exceeds expectations and wheel life is greatly increased. Result: a precision production operation that enables Marchant to produce the DECI • MAGIC at lower cost and with fewer moving parts, made possible by the advanced features and rigid design of the DoALL Surface Grinder.

Need more proof of DoALL superiority in surface grinding? Call your local DoALL Store, or write the DoALL Company, Des Plaines, Illinois—ask for literature on the complete line of DoALL Surface Grinders.

THIS IS A TYPICAL DoALL STORE

The DoALL Company, Des Plaines, Illinois GR-25

Call Your DoALL Service-Store

Machines and Blades · Surface Grinders · Power Saws · MACHINE TOOLS · CUTTING TOOLS · MEASURING INSTRUMENTS · SHOP SUPPLIES IN STOCK

HILL ACME Research and Development Facility

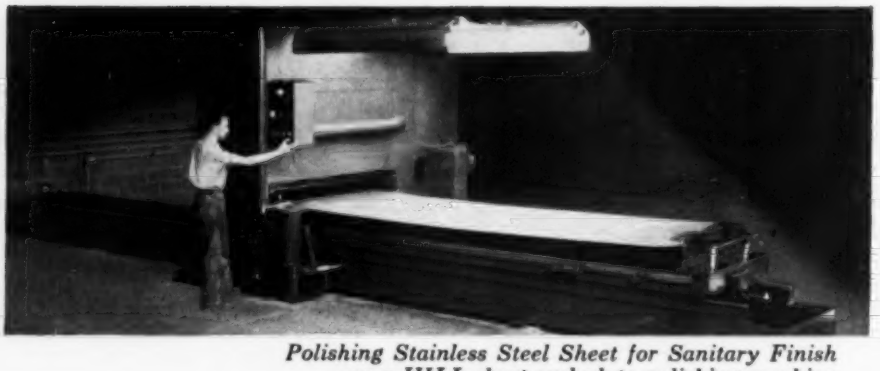
FRINGE BENEFIT!

FOR OUR CUSTOMERS . . .

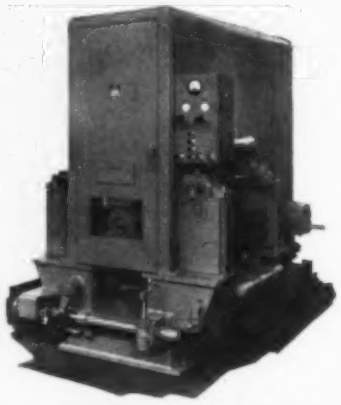
A brand new RESEARCH and TESTING facility where new methods and machines of HILL ACME manufacture are in operation on actual production work supplied by our customers and prospects for HILL Grinding and Polishing machines.

If YOU have a pre-finishing problem concerning ferrous or non-ferrous metals, plastic, lucite or similar materials we invite you to visit this innovation in the field of grinding and polishing.

The home of HILL Grinding and Polishing machines. Research facility is in foreground.



Polishing Stainless Steel Sheet for Sanitary Finish on a HILL sheet and plate polishing machine



HILL Pinch-Roll type machine for polishing strip on multiple units

THE HILL ACME COMPANY

1201 WEST 65th STREET
CLEVELAND 2, OHIO

Manufacturers of: **"HILL" Grinding and Polishing Machines • Hydraulic Surface Grinders • "ACME" Forging • Threading • Tapping Machines • "CANTON" Alligator Shears • Bar-Billet Shears • "CLEVELAND" Knives & Shear Blades**

---wherever abrasive operations are performed

EDITORS PAGE

SAVINGS CAN BE COSTLY!

Present conditions call for exceedingly deep thinking. We must consider every expenditure in the light of the amount of production going through the plant and consequently the income from slower sales. But let's not forget it can cost a dollar to save a penny!

There have been and will be too many improvements in methods to sit back and say, "We cannot afford to improve." The easy way out has always been to cut capital expenditures, but what about the mounting repair costs and the obsolescence by age and improved methods? Practically all of the operations in our plants today can be improved upon. It is therefore extremely important that each expenditure be carefully considered.

Probably the most used excuse for not replacing equipment is the present depreciation period required under our laws. Due to these laws, a company is not allowed to replace equipment when they want to or need to if they are to take advantage of the write-off period. This is a matter which requires your Congressman's attention. If the change in this law removes a deterrent in your buying power, it will do the same for your customers. Many people in our government believe this is a savings because it brings in the most right now. But what about the additional revenue that it would gain by increased business activity?

The above is one solution which can be obtained through our efforts in government solution. But what about our own plant? Isn't the same true there? Expenditures now for new equipment or for improved methods would certainly be costly and would necessitate the use of emergency funds. But aren't we in an emergency period? These emergency funds used now will be just the thing to cut your costs and increase the accuracy of your product and therefore develop that advantage in a buyer's market.

If this thinking is not included in your consideration of capital investments, the situation is indeed in jeopardy and no amount of savings can be obtained through steadily diminishing sales. These are the thoughts which prompt us to say, "Savings Can Be Costly!"

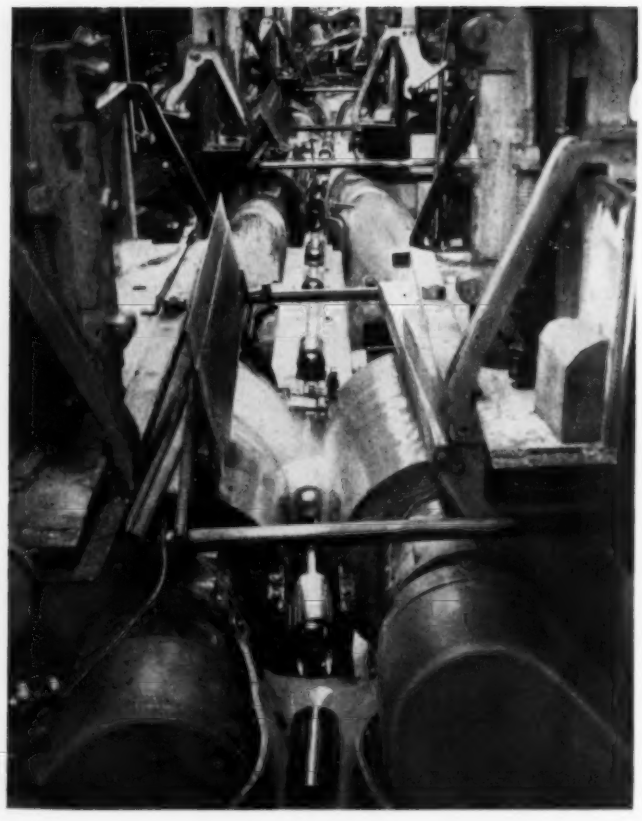
M. M. Patterson

MANAGING EDITOR

JUNE, 1958

MOTOR EQUIPMENT
MANUFACTURING DIVISION
THOMPSON PRODUCTS OF CLEVELAND

Grinds Premium Parts to Tenth on Straight Centerless Line



Progressive centerless grinding at the Motor Equipment Manufacturing Division of Thompson Products. Rough parts enter the grinders in the background and the finished parts leave in the foreground.

By **Darrell Ward,**
Field Editor

• The Motor Equipment Manufacturing Division of Thompson Products, Inc., has employed an old mathematical theory on straight line production with 7 centerless grinders to reach a true tolerance of .0001", hold finish below 4 rms, process a greater number of various size parts in small lots, free a number of skilled workers for greater utilization in other important operations, and most difficult of all, hold a gram weight specification for each part within a tolerance of plus-or-minus one gram.

Premium piston pins are made by M.E.M. for such companies as Ford, Allis Chalmers, Cerlist Diesel, Greyhound, General Motors, and Mack. The pins are made from SAE 1016, 1022, 8620, and 5015 solid bar which is cut off to rough size, bored and chamfered. Green grinding on No. 2 and No. 3 Cincinnati centerless grinders brings the part to within .010" of size. The part is carburized, stress relieved and heat treated to obtain a hardness of Rockwell 58-62 C with case depth allowance for stock removed in the finish grind. The metallurgical characteristics of piston pins, including I.D. and O.D. case depth, is critical in modern high performance engines.

These steps of processing are more or less standard practice at M.E.M. up to the point of finish grinding. But, from that point on, radical changes progressively moved into the picture because of current business conditions and standard practice in plants of original equipment manufacturers. Thomp-

Progressive Centerless Grinding at Thompson

	First Mach.	Second Mach.	Third Mach.	Fourth Mach.	Fifth Mach.	Sixth Mach.	Seventh Mach.
Wheel Size Cutting Tractor	24 x 8 x 12 14 x 8 x 5	24 x 8 x 12 14 x 8 x 5	20 x 8 x 12 12 x 8 x 5	20 x 8 x 12 12 x 8 x 5	14 x 22 x 6⅜ 14 x 22 x 6⅜	14 x 22 x 6⅜ 14 x 22 x 6⅜	14 x 22 x 6⅜ 14 x 22 x 6⅜
Brand	National	National	National	National	Carborundum	Carborundum	Carborundum
Mfr.'s Data Cutting Tractor	PA60-M-9V6 A-80-Q-R-2	PA60-M-9V6 A-80-Q-R-2	PA60-M-9V6 A-80-Q-R-2	PA60-M-9V6 A-80-Q-R-2	A-220-05-V80 C-320V-BY	A-220-05-V80 C-320-V-BY	C-500-T-BY C-320-V-BY
Speed R.P.M. S.F.P.M.	1000 6250	1000 6250	1000 6250	1000 6250	310 1782	310 1782	225 1293
Stock Removal	.003	.002	.0015	.001	.0005	.0002	None
Finish Obtained at Each of the Seven Stages (RMS)	30	20	15	10 - 12	8	5 - 6	3 - 4
Tolerance	±.001	±.0005	±.00025	±.0001	±.0001	±.00005	±.00005
Mach. Used at Each Step—Brand & Model Numbers	No. 3 Cinci. Gr. (Centerless)	No. 3 Cinci. Gr. (Centerless)	No. 2 Cinci. Gr. (Centerless)	No. 2 Cinci. Gr. (Centerless)	Cinci. Rough Lap (Centerless) 52MH1S-12	Cinci. Rough Lap (Centerless) 5M2H1B8	Cinci. Finish Lap (Centerless) 5M2H1H9

son's customers have found it easier to establish statistical standards for boring, then purchase pins of limited sizes to fit. The sizes of the pins are classified in gradations of .0001" with the customer normally specifying 80% at plus .0001" and 20% at plus .0002".

At first glance, this tolerance sounds more generous than it really is. To M.E.M., it means holding a true tolerance of only .0001" in order to hold specified proportions on an order.

Thompson had used the progressive grinding technique on high production lines for standard parts in years past. But, as tolerances began to close up in the auto industry, and more recently as individual orders called for smaller lots of parts, problems arose over the most economical way to handle the business. Could progressive grinding on straight line production work for small lots, especially since there might be a wide differential in size from one part to another? Set up time for different sizes is a big problem in small lot orders. And, could progressive grinding be made to work for premium parts as it did for standard parts? Premium parts ordinarily require special set up, tedious grinding and checking to maintain the finer tolerances.

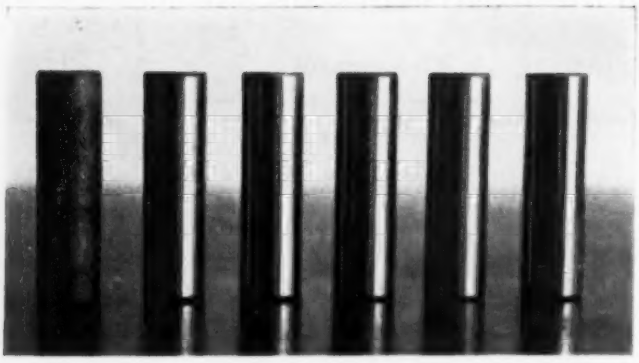
As industrial history evolved from large quantities of wide tolerance parts to smaller quantities of closer tolerance parts, a point was finally reached at M.E.M. where a $50,000 gaging and sorting device began to look like a threatening monster. It was formerly very efficient and completely satisfactory when large runs of similar size parts were produced. But now, it failed miserably in its designed purpose and capacity when tolerances were closer, job lots smaller, and parts of widely different sizes.

Someone pulled out his slide rule and recalled the old mathematical teaser of diminishing ratios. If you remove 50% of something, then take 50% of what is left, and again 50% of that, you go on to infinitum without ever removing the last bit. And, at some point along the way, the diminishing ratio curve tapers off fairly flat so that successive takes will remain within the limits of relatively small increments.

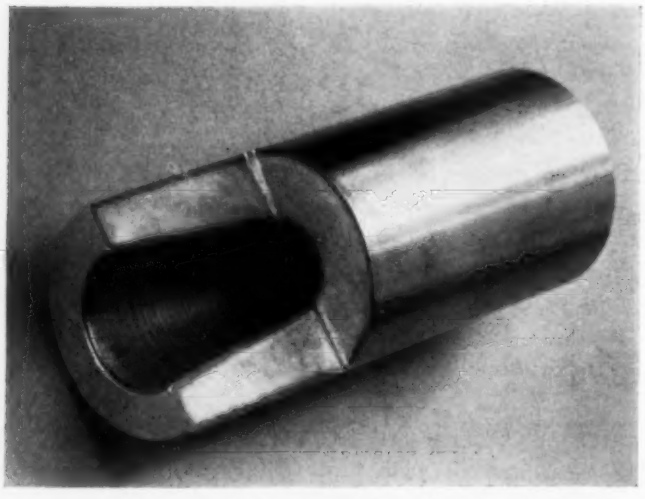
Why not apply this principle to a progressive grind so that the mathematical ratio of successive grinds will taper off into a continuum of diminishing ratios, all of which will fall within a specified tolerance?

Logically, the idea is practical. In practice, Thompson worked it out with minor variations relating

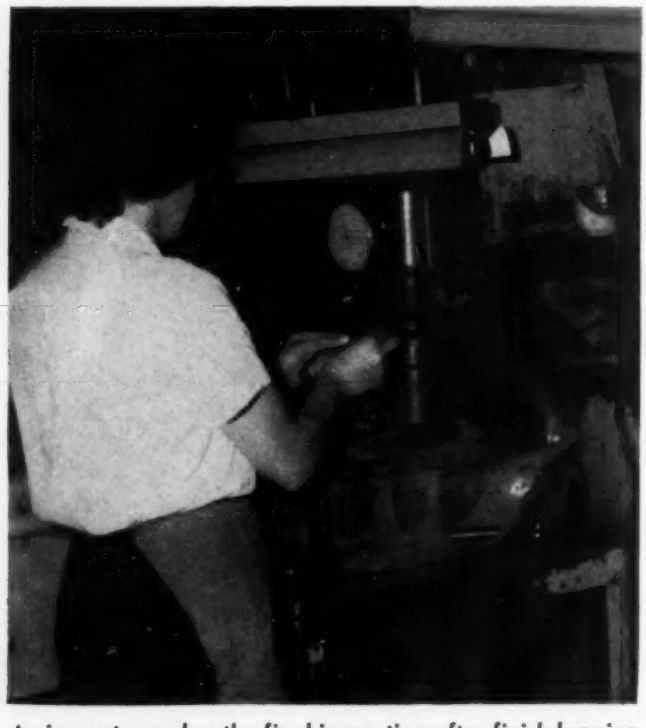
Thompson Products produces premium piston pins in myriads of size classifications in increments of .0001" for original equipment manufacturers. Pins in this view are the W-716 for a small air compressor, W-111 for Chevrolet, W-712 for Greyhound Bus, W-341 for Caterpillar Tractor. All are economically ground to close tolerance in small lots of 6,000 parts on straight line production.



Progressive grinding in through-feed line removes .010" in seven steps, after green grinding of rough part at left, and progressively works toward a 3 - 4 rms finish on this premium piston pin.



A cutaway of one of the large pins, showing the uniform depth of the heat treat case.



An inspector makes the final inspection after finish lapping on the last of three lapping machines.

to the nature of the individual machines, the wheels selected, and the condition of the part at each of 7 successive stages.

But, the whole problem embraced more than this simple sounding solution. Concurrently with the close tolerance for size control was the gram weight specification. Many parts must be within plus-or-minus one gram of specified weight (to maintain engine balance) in addition to specified size.

The sum of all the requirements meant that the grinding line had to be flexible for changes in size on short runs, the runs had to be made as economical in operation as a straight line for large run production, the parts could not become distorted from heat because they would run out of size or off weight, and therefore, wheel loading had to be kept down to a minimum while a large number of pieces must be run between wheel dressing. These were critical factors in avoiding grinding cracks and in meeting rigid surface requirements which, in some cases, were Magnaflux inspected.

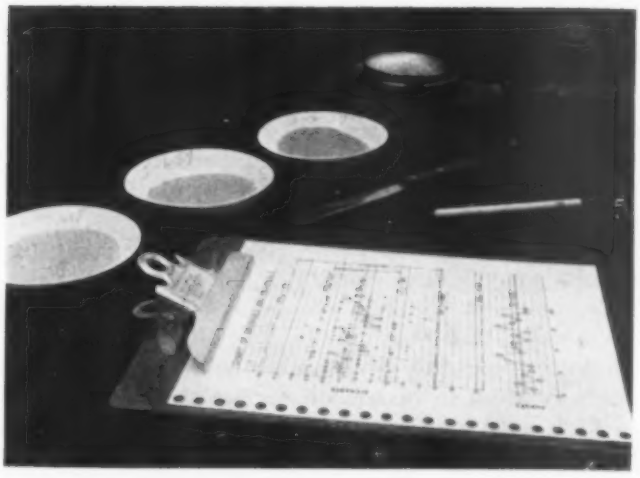
The total problem was solved by lining up two No. 3 Cincinnati centerless, and two No. 2's for progressive grinds followed by three Cincinnati centerless lapping machines, two for rough lap and one for finishing. A small chain link conveyor feeds straight through from one machine to the next with provisions for offsetting and checking parts at each station.

Starting with the .010" allowed for finish grinding, stock removal at stage No. 1 is .003", plus-or-minus .001"; at the second, .002", plus-or-minus .0005"; third, .0015", plus-or-minus .00025"; and fourth, .001", plus-or-minus .0001". These are considered the primary grinding operations while the subsequent stages are called lapping because of the small amount of metal being removed.

Stock removal at the fifth machine is .0005", plus-or-minus .0001"; at the sixth, .0002", plus-or-minus .00005"; and at the final or seventh, no more material is removed as the finish is brought to a final 3 to 4 rms in a burnishing type of action. Burnishing in the last stage guarantees a lower initial rms than a similar finish developed by successive grinding.

Standard dial gages are used for checking size with random parts being removed from the line and checked by one of the four operators. Parts move along the line at the rate of 140" per minute to produce a continuous flow of approximately 2400 parts per hour. Operators work to standard gage and pass information along the line with reference to operating conditions at the moment. This kind of close coordination holds rejects to a minimum, another factor whose importance is increased by shorter runs.

A significant feature of this set up is the simplicity of operation, the ease with which size can be changed for different parts by adjusting the machines in succession, and the free cutting of metal with little or no wheel loading and metal distortion because of the small amount of stock removed at each step. Consequently, wheels will grind between 2,000 and 3,000 parts between dressings. • • •

Charts on averages and ranges show process trends as they develop and indicate when corrective action is needed.

Part II

Quality Control Cuts Rejects in Half

Quality control starts with raw material testing and continues through to the customer's use

by **James R. Gilman**
Manager of Quality Control
Bay State Abrasive Products Co.

Quality control must be more than mere inspection. By putting a good quality control system to work an abrasive company can cut production line rejects in half. This results in advantages to both the company and the customers.

• What actually is "quality control"? Essentially it is the application of technical know-how and teamwork supplemented by modern statistical techniques to the production of grinding wheels. It starts with the testing of raw materials for suitability as they enter the plant. It constantly examines and controls the manufacture of the product . . . provides a final check as the product leaves the plant . . . and, occasionally, even follows the product to the customer.

The Standard Practice System

Quality Control engineer is assigned to service every product line. One of this man's most important functions is the writing of "Factory Standard Practices" . . . instructions to the Production Departments detailing manufacturing procedures for every one of our products. Often a single product will require 60 to 80 pages of instructions.

Work begins on Factory Standard Practice when the Research and Development Laboratory is ready to transfer a new product from the Laboratory to the production line. At this point, the Quality Control engineer assigned to the particular line the product will enter works with Research and Development people . . . sets out to acquire a complete and expert knowledge of the new product. In so doing, he may even be able to contribute to the product's development through his knowledge of manufacturing equipment and production techniques.

Through the Standard Practice, the Quality Control engineer acts as a "bridge" between Production and the Research and Development Laboratory for introducing new products. He takes a Research Standard Practice already written by Research and Development and expands it . . . making the manufacturing instructions more explicit and exact, more detailed and complete . . . so there can be no possibility of error on the part of production personnel. This entire transfer process is an excellent example of company teamwork.

The Quality Control engineer organizes all the information he acquires according to processing steps using the Dewey Decimal System . . . from raw materials standards and tests right up through final inspection and shipping instructions.

Standard Practice files form a library of standards for manufacturing purposes and are readily available for reference. In addition, copies are circulated to all other departments interested . . . such as Purchasing, Sales Engineering and Time Study.

The Quality Control Engineer

It's clear that the Quality Control engineer is a person with a great deal of responsibility. Much

of the company's operation depends upon his knowledge of the company's products and manufacturing processes. Therefore, he must be highly trained . . . an expert in every phase of manufacture in the product line he services.

His duties include setting standards for raw materials . . . supplying technical manufacturing details . . . providing technical service to the Production Department . . . and improving manufacturing processes to eliminate variability, to reduce costs, and make products better.

To make sure that our Quality Control engineers continue to be the experts we hire, we periodically send these men to school for additional training. In fact, most of them have been through the University of Connecticut's famed Advanced Quality Control School where they have been taught the most advanced quality control techniques and statistical procedures.

Quality Control Techniques

Although the Quality Control engineer is primarily concerned with developing smooth-functioning standardized processes, he spends a considerable part of his time in the role of trouble shooter. He is also available to assist and service other departments in the plant as well as the production departments. As a result of his extensive training, he has at his command many modern statistical techniques to use in providing these services.

Among the techniques he employs are Random Balance Experimentation . . . Factorial Experimental Design . . . Analysis of Variance . . . Process Capability Studies . . . and Surface Response Experimentation.

Using these statistical experimentation techniques, our engineers are able to make the most efficient use of their time . . . solve problems with a minimum of delay and a maximum of assurance. For example, one of our men recently completed a Random Balance experiment in which he investigated seventeen variables simultaneously. All were suspected as possible causes of certain problems arising in the manufacture of resinoid cut-off wheels. In this particular experiment, results showed that two of the seventeen variables were significant in causing the problem. Curiously, these two would ordinarily never have been suspected of being trouble-makers.

More important, using this quality control technique, the engineer was able to reduce what might have been months and months of experimentation to just 30 experiments . . . requiring less than one week to perform. Here's real proof that quality control cuts costs.

How Trouble Is Spotted

In addition to his personal observation of the manufacturing processes and his continual contact with manufacturing personnel, the efforts of the quality control engineer are guided by a weekly

QUALITY PERFORMANCE REPORT FOR WEEK ENDING _____ Page 1

TOTAL - VITRIFIED - MOUNTED POINTS

PRODUCT	TOTAL	REJECTS	%	COST OF REJECTS	CHIPPED	CRACKED	BROKEN	O.D.B.	BROKEN SPEED TESTER	SIZE SUPPLY	RUN OUT	WARP	OFF GRADE	PIN HOLES	TAPERED O.D.R.	BROKEN OR CUT SHANKS	POORLY MTD. RUN OUT	BINDER BURNED	PRESSURE CRACKS	TIGHT OR LOOSE HOLES	MISC.	MISSING
All																						
1V																						
2V																						
3V																						
4V																						
6V																						
7V																						
9V																						
0V																						
VIT																						
M																						
5V																						
5R																						
5T																						
5B																						

RESINOID - FLEX LINES - RUBBER

					CHIPPED	CRACKED	BROKEN	O.D.B.	BROKEN SPEED TESTER	SIZE SUPPLY	RUN OUT	WARP	OFF GRADE	SHANKS IMPER-FECTION	LUMPS	PITS	SHORT FILL	NYLON IMPER-FECTION	GREEN EDGES	POOR HOLES	MISC.	MISSING
1A																						
2A																						
3A																						
4A																						
BZ																						
1B																						
2B																						
3B																						
6B																						
9B																						
"B																						
4C																						

(Q.C. Form #26)

Quality Performance Report published by the Quality Control Department. This report lists every product line . . . shows total made, total rejected, cost of rejects, and a breakdown of the reasons for all rejections. Detailed information is given on all large quantity rejections.

The Quality Control engineer analyzes this information to determine when a process is in or out of control, when it is trending better or worse, or remaining stable. His analysis tells him where he can best put his efforts to work.

The Quality Performance Chart is one way of spotting trouble . . . another is the use of Average and Range Charts. These are charts on which the production operator records pertinent data about the product as he works on it. Since this point-of-production inspection comes before final inspection, it provides an earlier, more economical means of detecting manufacturing errors and product flaws. For instance, the press operator records on control charts, the average and spread of weight and thickness readings of wheels as he makes them. These charts show process trends as they develop and indicate when corrective action is needed before large quantities of defective material are produced.

The Final Inspection Area

Final inspection is handled by the Chief Inspector and a staff of technicians who operate under his direction. A quality control expert, the Chief Inspector, is responsible for setting standards and procedures for all final and some in-process inspection.

Working through his team of technicians, the Chief Inspector also checks factory equipment for conformance to quality control standards . . . maintains a file of customer cards on special quality requirements for certain products and customers . . . makes daily humidity checks to insure proper atmospheric conditions for manufacture of our products . . . types and edits all Standard Practices as submitted to him by Quality Control engineers . . . and with quality control personnel, investigates all customer complaints.

In addition, through a floor inspector, the Chief Inspector is available for decisions on borderline products. In fact, the floor inspector refers any or all decisions to the Chief Inspector if he feels it is necessary. The Chief Inspector may in turn call in Sales Engineering or, in certain cases, even the customer himself.

The Roving Check Inspector Technique

Also working for the Chief Inspector is a roving check inspector who supplies a further check on final inspections by checking random samples of packaged material which has already passed through the final inspection stage.

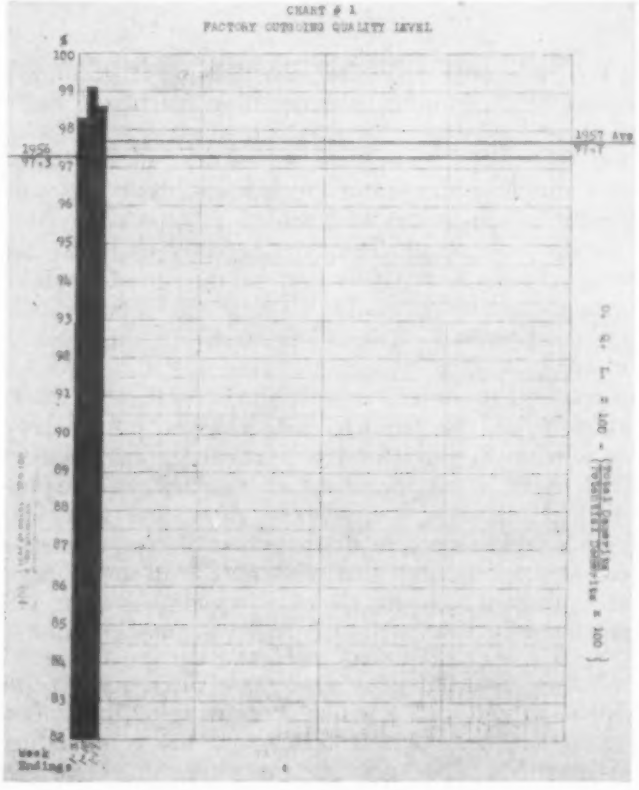
Based on the check inspector's findings, an Outgoing Quality Level Rating is given to the inspection line on which the production inspection is performed by production personnel. These ratings are plotted on Outgoing Quality Level charts which are published weekly and are one of our most effective means of insuring the quality performance of production inspectors. This is a technique which Bay State has developed as a means of providing a production-type bonus on an inspection job. That it is effective, is proved by the fact that although inspection unit costs have stayed constant . . . quality has improved and customer satisfaction increased.

Sampling plans used to inspect our products are set up by the Chief Inspector. Twenty-two different sampling plans are used to cover the types of inspection which we consider necessary for our various products. Each sampling plan is scientifically designed to provide the level of assurance required for the type of inspection being carried on. For example, in dimensional tolerance inspection a high level of assurance is needed. In a lot of 100 wheels we, therefore, inspect 50 to fulfill our AQL (Acceptable Quality Level) requirement of 0.25%. Visual check of markings for appearance is less critical. We inspect only 7 wheels in a lot of 100 to meet our AQL of 2.5% for this characteristic.

Trouble-Shooting In The Field

Like all manufactured products trouble occasionally occurs in the field. When it does, the Quality Control engineer is often the man who sets out to find the cause.

Investigations of shortcomings reported from the field often have been the basis for product improvement. In fact, in the abrasives industry actual field testing frequently points out areas of possible product improvement that otherwise might well go unnoticed. An efficient quality control organization is able to quickly analyze field data and recommend modifications so that the product meets the customer's requirements. • • •



Part IV

Recommended Methods of Cleaning Coolant on Grinding and Finishing Machines

By **Arthur L. Wilson**
Filtration Engineer
Barnes Drill Co.

- ***Chart of particle sizes of swarf from various machining operations.***
- ***Chart of recommended methods of coolant cleaning on various operations.***
- ***A glossary of coolant cleaning terms.***

• It is very difficult for us to say there is one "best" method of cleaning coolant for any particular type of grinding or finishing machine. Several factors enter into the selection of a piece of equipment and, as previously noted, with the wide variety of types of coolant cleaning equipment available, these factors must also be considered. In the previous discussion where micronic sizes were discussed and contaminant loads considered, we mentioned that two similar grinding jobs may produce particles of varying sizes and varying contaminant loads depending upon the habits of the machine operator, the type of grinding wheel used or the quality of the machine tool.

You will note on Table III that there is shown a variety of grinding and finishing machines. Each of these has some characteristic of design or function that will differentiate it from its nearest likeness and it is this point of differentiation that will greatly influence the selection of a piece of coolant cleaning equipment. The type of filter that may be required for a heavy stock removal disc grinder would certainly not be applicable on the fine coolant cleaning requirements that are presented by a lapping or superfinishing machine. Likewise, it would be impractical to install a very highly efficient filter, which would be required for a lapper, on a heavy stock removal, horizontal or vertical surface grinder. This chart is not meant to be the basis for equipment selection but merely to show you that you have a wide choice in the selection of coolant cleaning equipment and that you may find more than one piece of coolant cleaning equipment that will satisfactorily handle the job that you may encounter.

Notice that the gear shaver can utilize the principles of settling, straining, centrifuging, magnetic separation, edge type filtering and the combination of magnetic separation and area type filtration. Of course, area type filtration might be the selection only because the "needles" produced by a gear shaver are non-ferrous. Similarly, Edge Type Filters would not be entirely satisfactory by themselves because they would have a tendency to "blind" too early in the coolant cleaning cycle. Therefore, we have recommended that the Edge Type Filter be used only following the settling of the contaminant or after magnetic separation.

There is one general "rule of thumb" that may be applied to the selection of this equipment, that being, that the finer the finishing operation, the fewer pieces of equipment you will have from which to select. Along this same line, we might note, that with heavy stock removal grinding operations, you have a wide variety of equipment from which to make a selection but as the efficiency of these pieces of equipment increases, so will your initial investment. Therefore, the mere fact that you have this wide field of selection does not mean that the results you will require may be accomplished at a very low cost. It may be that a heavy stock removal grinding operation might require an expensive piece of coolant cleaning equipment because of the nature of the coolant or the nature of the contaminant. Illustrating this point, you might have a double disc grinder that uses a heavy or high viscosity coolant and the material being ground would be a ceramic or perhaps cast iron. Both of these materials when ground produce a very fine grinding swarf and the combination of small particle size and high viscosity will require a more costly piece of coolant cleaning equipment than if this same grinder were grinding a 1040 steel and where water soluble oil was used as a coolant.

In keeping with this previous discussion, we have shown some basic principles that should be considered when selecting a piece of coolant cleaning equipment. Of course, there are exceptions to all of

Table III

RECOMMENDED METHODS OF CLEANING COOLANT ON VARIOUS GRINDING & FINISHING MACHINES

	1 Settling	2 Straining	3 Centrifuging	4 Magnetic Separation	5 Area Type Filtering	6 Edge Type Filtering	7 Depth Type Filtering	8 Flotation	Combinations of:
Gear Shaving	X	X	X	X	X[e]	X[g]			4-5
Disc. Grinding	X[a]			X	X[b]			X[c]	1-4 4-5
Belt Grinding				X	X[b]		X	X[c]	1-4 4-5
Horiz. or Vert. Surface Grinding	X[a]			X	X[b]		X[b]	X[c]	1-4 4-5
Cylindrical Grinding				X	X[b]		X[b]	X[c]	4-5 4-7
Centerless Grinding				X	X[b]		X[b]	X[c]	4-5 4-7
Internal Grinding				X	X		X[b]		
Cam Grinding					X		X[b]		
Finish Roll Grinding				X[d]	X		X		
Gear Grinding			X	X[d]	X		X		4-7
Thread Grinding	X[a]	X[b]	X	X[d]	X		X		
Crush Form Grinding			X	X[d]	X		X		
"Through the Wheel" Grinding							X		
Electrostatic Grinding			X		X		X		
Honing			X		X[df]		X		4-5 4-7
Lapping							X		
Superfinishing					X[df]		X		4-5 4-7

a) Large settling tank only
b) Low micro-finish only
c) Central system
d) Oversize equipment recommended
e) Use with non-ferrous metals
f) Use with low flow rates only
g) Following settling

these principles but over the years, field experience has proved that through the use of these guiding principles, you will minimize the errors that you make in equipment selection.

PRINCIPLES TO BE USED AS A GUIDE IN SELECTING COOLANT CLEANING EQUIPMENT

1. Choose a level of coolant cleanliness no higher than that required to give you the desired machining results.
2. Use filters only as a means of *maintaining* a good finish. (Filters will not improve finish if machine tools aren't capable of producing required finishes when a fresh, ideal coolant is used.)
3. Choose your equipment to handle capacities equal to the highest required flow rate and lowest annual ambient temperature.
4. Use the lightest coolants (viscosity) possible. High viscosity means high coolant costs, higher coolant cleaning cost and greater initial investment.
5. Use automatic, multi-stage cleaning where practical. Self-cleaning settling tanks followed by secondary coolant cleaning equipment are very satisfactory.
6. Select recommended equipment on the basis of laboratory sample analyses or trial installations. Don't buy on promises or estimates unless absolutely necessary.
7. Where pressure is required to operate a piece of coolant cleaning equipment, try to obtain equipment that will operate above atmospheric pressures. Use caution where equipment offering pressures no higher than atmospheric are recommended.
8. Designed coolant systems so that the coolant will re-circulate through the coolant cleaning device when the coolant flow to the machine tool has been interrupted or temporarily discontinued.
9. Let gravity remove solids where practical. Settling tanks are always a good investment if they are equipped with drag conveyors and followed by a good, practical secondary cleaning device. Gravity is usually one source of your trouble. Use it to your advantage.
10. Allow for future expansion or increased flow requirements on any piece of coolant cleaning equipment you purchase or build. Usually, the higher the capacity of a piece of coolant cleaning equipment, the lower the cost of cleaning each gallon of coolant will be.
11. Purchase equipment that requires little maintenance and a low continuing cost.

Table IV shows you some typical examples of the particle sizes of swarf obtained from several finishing operations. Although, as previously noted, there is room for a departure from the figures shown on Table III, you will note two machining operations produce the same type of swarf or contaminant. Note particularly that the cast iron honing operation produced 98.3% of its swarf in the range below 44 microns. This is the reason why honing oils used in the honing of cast iron bores and cast iron

Table IV

Typical Examples of the Particle Size of Swarf From Several Machining Operations
Particle Size, Microns (% By Wt.)

Operation and Material Machined	SIEVED					Estimated Particle Sizes Under 44 Microns			
	Above 297	149 to 297	74 to 149	44 to 74	Below 44	25-44	10-25	5-10	0-5
Abrasive Belt Grinder (Steel)	.6	21.8	46.5	16.0	15.1	35.0	50	15	Nil
Double Disk Grinder (Steel)	2.9	22.1	31.7	20.0	23.3	5.0	5	60	30
Thread Grinder (Steel)	8.6	16.6	25.0	23.8	26.0	45.0	35	20	Nil
Internal Grinder (Steel)	4.2	4.3	11.0	20.5	60.0	20.0	35	25	20
Crush Form Grinding (Steel)	1.5	9.7	26.8	51.0	11.0	25.0	40	35	Nil
Cylindrical Grinding (Cast Iron)	.5	3.1	12.9	24.9	58.6	20.0	25	25	30
Honing (Cast Iron)	.2	.2	.4	.9	98.3	20.0	20	29	20
Centerless Grinding (Steel)	2.7	2.9	13.0	46.3	35.4	11.8	11.8	5.9	5.9
Many Different Types of Grinders (Central System)	5.0	15.0	25.0	25.0	31.0	8.0	7.0	5.0	4.0

(# Determined by NBS Sieves)

GLOSSARY OF COOLANT CLEANING TERMS

ABSORB: To take up by cohesive, chemical or molecular action.

ACTIVATED FILTER: A filter that changes elements of the chemical make-up of the liquid as it passes the filter medium.

ADSORB: To take up by adhesion of molecules of gases or dissolved substances to the surface of solid box, resulting in high concentration of the gas or solution at place of contact. Gas or solution is condensed on the surface of the adsorbent while in absorption, the material absorbed penetrates throughout the mass of the absorbent. (See absorb).

AGGLOMERATE: To gather or accumulate.

AREA TYPE FILTER: A filter utilizing only the surface area, not the depth, of the medium.

BACKWASH: Temporarily reversing the flow of a liquid through a filter so as to dislodge the accumulated solids from the filtering medium.

BATCH: The term given to filtration where the solids are separated from the liquid in an operation completely detached and at a separate time from the activity contributing to the contamination of the liquid.

BY PASS: To divide a fluid stream taking a measured amount of the liquid through a filter.

CAKE: The formation of the impurities of filter aid built up on a filtering medium.

CARTRIDGE: A replaceable filtering medium used in pressure type filters.

CENTRAL SYSTEM: A method of installing filters and accessories so that one coolant cleaning unit will service a number of contaminant producing machine tools.

CENTRIFUGES: A mechanical device utilizing centrifugal force to accelerate gravity and thereby cause the separation of materials of unequal density.

CLARITY: Cleaning of liquid to transparency by visual test.

CLEANING EFFICIENCIES: The term used to describe the effectiveness of a liquid cleaning device.

CONTAMINANT: The term applied to the foreign matter or matter you wish to remove from a liquid.

CONTAMINANT LOAD: The amount of contaminant prevalent in a liquid.

DEPTH: The term used to signify a mass of solids or filtering medium through which a liquid must pass.

DEPTH TYPE FILTER: A filter utilizing three dimensional filtration, as differentiated from area type filtration.

DIATOMACEOUS EARTH: Shell deposits of a microscopic plant or algae found in the sea or in surface deposits on the crust of the earth.

EDGE TYPE FILTER: The filter utilizing the edges of the medium to provide interstices large enough for the passage of liquids but small enough for the retention of solids.

EMULSION: A mixture of two substances, one a liquid, which has as its make-up finely divided particles of matter orienting themselves with the liquid in such a way as to present a uniformly constituted mass which is stable under the conditions for which it was compounded.

FILTER AID: Any finely divided substance that may be added to a solid—liquid mixture which will make an Area Type Filter more efficient. The finely divided substance when retained by a filter cloth will permit a higher degree of filtration than the cloth alone would give.

FILTER LIFE: The length of time that a filter may remain in operation from the beginning of the filter cycle to the complete closure of all effective interstices of the filtering medium.

FILTER MEDIUM: The material of which a filter is constructed and which performs the actual process of filtration.

FINES: The particles that will pass through a piece of coolant cleaning equipment and are attributable to the inefficiency of the equipment.

FLOTATION: The physical process incorporating the principle of air agitation and subsequent elevation of fine materials by air bubbles to a point where this fine material may be removed by a secondary mechanical device.

FLOW RATE: The period of time required for a known amount of solids laden liquid to pass a filtering medium.

FULL FLOW: The term used to designate the method of utilizing a piece of coolant cleaning equipment in such a way that the equipment will handle 100% of the liquid and dirt produced by a machining operation.

FULLER'S EARTH: A type of clay having as an inherent property, the ability to adsorb certain materials from liquids.

INERT FILTER: An area or depth type filter utilizing the absorptive principle of filtration.

MESH: The measurement and means of designating the interstices of a filter cloth or screen.

MICRO INCH: Linear measurement one millionth of an inch.

MICRON: A unit of linear measurement used to represent one millionth of a meter (.00003937").

PARTICLE SIZE: The linear measurement in any of the three dimensions of a particle of solid.

PRESSURE FILTER: A filter utilizing the principle of force other than that of gravity as a means of propelling a liquid through a filtering medium.

PURIFY: To clean a liquid from a contaminated state to the state of cleanliness equivalent to that of the new liquid.

RMS: The first letters of the term, Root Mean Square, which is the square root of the mean of the squares of the elevation or height of the irregularities of a generated surface.

SSU: Sayboldt Seconds Universal (sometimes called Sayboldt Universal Seconds) which is a representation of the amount of time in seconds required to fill a vessel to a level of 60 milliliters at some known temperature.

SEPARATOR: Any device used to separate two solids, two liquids or two gases or solids from solids, solids from liquids or solids from gases.

SETTLING: The principle of allowing the force of gravity, acting upon particles of contaminant, to cause the particles to remain out of suspension.

STRAINING: The process of eliminating particles from a liquid by means of a medium having controlled interstices.

SURFACE FILTRATION: See Area Filtration.

SUSPENSION: A condition existing in a solid—liquid mixture where forces greater than gravity will not permit settling of the solids.

SWARF: The term applied to the solids generated by a grinding operation causing the coolant to become contaminated. (Sometimes called dross).

TURN OVER TIME: The length of time required for filtration or cleaning of the entire volume of coolant or liquid found in a reservoir.

VACUUM FILTER: The term applied to the type of filter utilizing atmospheric pressure as the means of forcing the liquid through the filtering medium.

VISCOSITY: The measure of thickness of a liquid.

VISCOSITY INDEX: An empirical factor which represents any change in viscosity due to a change in the temperature of the liquid.

WASTE: A fibrous material found in depth or absorptive type filters.

components is so difficult to clean. Also note that the internal grinder produced a swarf which had 60% of its particle range below 44 microns. This is usually because the material being ground is inclined to be very hard and the stock removal very light. In general, light stock removal operations produce a swarf composed of smaller particle sizes than heavy stock removal operations. Reliable coolant cleaning equipment manufacturers are in a position to analyze the swarf samples that come from these many different machining operations and will recommend coolant cleaning equipment on the basis of the laboratory analysis. Engineers should use this wherever possible because it better acquaints them with the problems of cleaning coolant and also gives them an opportunity to justify the cost of cleaning coolant where possibly the higher priced piece of equipment would do a much better job than the cheaper piece of equipment due to the fact that the results produced by the higher priced piece of equipment would be better than those of the low priced unit. Some engineers look upon the laboratory analysis of the solids as being one of prime requisites for the selection of coolant cleaning equipment. Just, as the time the sugar sack over the coolant spout is passing, so is the selection of coolant cleaning equipment based merely on the fact that the equipment is low priced and easy to install. Inroads into the science of cleaning coolant are being made every day by competent filtration engineers who are basing their recommendations on laboratory analysis rather than "rules of thumb." • • •

Flap-Type Coated Abrasive Wheels

- *slash finishing time*
- *have wide application*
- *are easy and inexpensive to use*

By **Morrey Patterson**
Managing Editor

• An appliance manufacturer reduced overall finishing costs on one of his products by 66% . . . a dairy machine manufacturer realized a 75% savings on a difficult finishing problem . . . railroads slashed precious maintenance time . . . automotive suppliers upped production.

The common denominator in these cases is the flap-type coated abrasive wheel.

Manufacturers do not claim the wheel to be infallible nor the answer to all light grinding and finishing problems (heavy grinding is performed by coated abrasive belts), but after hard, definitive use on some of the nation's busiest production lines (appliance, automotive, furniture) it may be said:

1. In many instances the abrading-polishing action of the wheel produces a finish that can be plated or painted without buffing.
2. That draw marks and other imperfections are removed in the same process which generates a buff-type finish.
3. With proper use (and on machinery that is in good repair) the life of a flap wheel is exceptionally long compared to setup wheels, brushes, sisals and in some instances coated abrasive belts.
4. That downtime is slashed to a minimum—only the time it takes to put a new wheel on a spindle.

Ed note: We acknowledge with thanks the help of the Minnesota Mining and Manufacturing Co., and Merit Products, Inc., in the preparation of this article.

Versatility plays a big part in the wheel's applications. At present there are wheels on polishing lathes, bench grinders, portable and flexible shaft tools, swing grinders and automatic equipment including straight line and rotary machines. Part of the basic thinking that went into the design of the wheel was that it could be used on automatic finishing lines as well as in shops that perform offhand operations.

Variety in wheel construction has been carefully considered. Aluminum oxide, silicon carbide and garnet mineral are available on wheels being sold to metal, glass, plastics and woodworking industries. Backings for the abrasive minerals include two types of cloth (drills and jeans), as well as paper; and at least three types of bonds are in production—glue, resinite, and straight resin.

Flap-type coated abrasive wheels are being used for light stock removal, polishing, deburring, blending, generating specific types of scratch patterns; paint, rust and light scale removal, and similar operations. In general, the larger wheels (12-in. in diameter and up) are more effective for light stock removal than are the smaller diameter wheels; the smaller wheels are used for cleaning and blending operations, and generating a finish which in some instances is being plated without buffing.

The now well-known trade names of these new wheels reflect their characteristics — Grind-O-Flex,

(flexible grinding wheels); P.G. Wheel, (polish-grind wheel); Kon-Toor Wheel, (contour polishing wheel).

Economics of the Wheel

Among the economics of the wheel perhaps simplicity plays the biggest part. There is no extra time required for regluing and applying loose mineral grain such as there is with set-up wheels. Ordinarily, an oil sprayed on the wheel or on the work piece performs the lubricating job right up through the polishing stage—eliminating time spent with buffs and compounds for polishing. There is no waste material—since the backing actually performs a buffing action as it wears away with the wheel. Flap wheels are resistant to filling because only the tips of the leaves are in contact with the work and in normal use any abrasive that has a tendency to fill is worn away.

If the contour of a work piece is very simple the wheel is flexible enough to conform to it. In slightly more complex contours the wheel will shape itself. For severe contours the wheel may be preshaped to fit the workpiece, and will retain this shape through its end point (assuming that it is used on the same shape throughout its life).

Construction of Flap Type Coated Abrasive Wheels

The polishing element in this new tool is a series of coated abrasive leaves or flaps. These flaps are arranged into a circle to form a wheel, the base ends of the flaps bonded together and the free ends extending unrestrained to exert a brushing or "wiping" action on the workpiece. The wheel is usually mounted between a pair of side plates which support the wheel during operation and are designed to strengthen the wheel against the high centrifugal forces developed in rotation and the impact (particularly in automatic operation) on contact with the workpiece.

Two variations of the fundamental design are notable; in one manufacturer's construction, the abrasive leaves are pleated and folded, being anchored to a hub unit at the fold, with the abrasive leaves coated on both sides with grain. The action is similar to the standard type. In another construction, the wheel is formed of a series of segments of abrasive leaves which are attached by the user to the hub unit. In this construction, the abrasive leaves are supplied in *slashed* abrasive cloth as well as plain. The slashing is designed to shred the cloth into filaments, increasing the wheel's flexibility and enabling it to envelop contours.

The extremely long life of these wheels is due to the fact that such a large amount of abrasive can be contained in one wheel. A 16-in. diameter wheel, for instance, will contain between 1400 and 1600 leaves. Since the leaves are approximately 4-in. long in this diameter wheel, this means an abrasive content equivalent to 35 to 45 belts of 168-in. length. Even the smaller diameters such as the 6-in. wheel will contain 200 to 250 leaves (in medium grit ranges) of approximately 2-in. length—roughly equivalent to a half dozen 60-in. belts.

Another quality of these wheels is this: the abrasive scratch is absolutely uniform for the entire life of the wheel. As the leaves wear down in use, constantly new, sharp abrasive grain is presented to the work, always of a uniform unfractured size, making for an unvarying finish from first to last workpiece.

Range of Wheel Sizes

Wheel sizes range from 3-in. up to 16-in. Certain "specials" are available up to 21-in. in diameter. Preferred for use on buffing lathes and on automatics are the 10-in., 12-in., 14-in., and 16-in. diameters. For use on smaller buffing arbors or pedestal grinders, or simply mounted on motor shafts, the 6-in., 8-in., and 10-in. diameters are recommended by the manufacturers. The 3-in. and 6-in., and sometimes the 8-in. diameters, are generally preferred in portable work.

Wheel widths are available up to 6-in. or even 8-in. in the larger diameters, usually 14-in. and over. One

-in. x 2-in. wheel used on air motor t 4000 rpm for polishing cold rolled eel surface.

3-in. diameter wheel used on ¼-in. electric drill motor for blending rough-ground welds and bend marks.

12-in. diameter x 2-in. width wheel in No. 60 grit used in smoothing rough-ground casting.

Summary–Flap Wheels vs Other Methods of Finishing

Operation	Flat Wheel Size, Grit, Mineral, Sequence, Etc.	Type Of Machine	Previous Method	Comparison		Results Comments
				Previous	Flap Wheels	
Buffing stainless steel mixing bowls	4" x 16" aluminum oxide grits 280, 320, 400	Rotary automatic	Sisal buffs	Buff life: 17,000 pcs. 61½ hrs. avg.	Wheel life: 50,000 pcs. 139½ hrs. avg.	Production tripled Downtime cut by 1/3
Polishing ID of stainless steel ice cream evaporators	2" x 6" aluminum oxide grit 150	Portable straight shaft grinder	Used abrasive sleeves in a grit 60, 80, 120, 320 sequence	Abrasive cost per unit: $1.80	Abrasive cost per unit: $.035	98% reduction in abrasive costs
				16 hours required for dairy finish	2 hours required for dairy finish	87.5% savings in time
Removing carbon and grease deposits from EMD cylinder heads	2½" x 6" aluminum oxide grit 50	Portable straight shaft grinder	Wire brush	25 minutes per head, including 5-minute soak in solvent	12 minutes per head, including 5-minute soak in solvent	50% savings in time
						more consistent finish
						safer operation; coated abrasive leaves are locked into hub
Cleaning ID of EMD cylinder housings	2½" x 6" aluminum oxide grit 80	Flexible shaft 3400 r.p.m.	Wire brushes Abrasive sleeves	→	"Twice as fast" as previous method	50% savings in time
						more consistent finish
						safer
Cleaning ID of roller bearing housings made of grey iron	2½" x 6" aluminum oxide grit 50	Portable air grinder 4500 r.p.m.	Abrasive sleeves grit 80	Required several sleeves per housing; slow due to abrasive filling, downtime	One wheel good for several housings; no downtime during cleaning	Save time
						Grit 50 wheel gives finish comparable to or finer than grit 80 sleeve
Finishing aluminum coffee pot shells	8" x 16" silicon carbide grits 240, 280, 320, 400 (Following two belt heads grit 180 and 220 for roughing)	Rotary automatic 1750 r.p.m. 6 stations	Five heads with abrasive belts, sixth head with sisal buff	Avg. belt life 150 pcs.	Avg. life of grit 240 & 280 wheels is 34,000 pcs; for grit 320 and 400 up to 65,000 pcs.	Abrasive cost reduced 84.5%
Finishing cold rolled steel prior to brass plating	4" x 16" aluminum oxide grit 80 (wheel self-shaped to the workpiece)	Semi-automatic floor lathe	Sewed buffs with grease to remove orange peel; sisals & compounds to get platable finish	300 units in 8-hour shift	1,900 units in 8-hour shift	533% increase in production
Preparing the OD of carbon steel tubing for plating	6" x 18" grits 180, 220, 240, 320; aluminum oxide; 320, 400 (greased) silicon carbide	OD polisher, 6 head tandem centerless machine	Abrasive belts. Steam clean; grits 180, 220, 240, 320; hand buff; clean prior to plating	Steam cleaning essential	No steam cleaning required	Reduction in number of operations
				250,000 lineal feet ground per belt (avg.)	350,000 lineal feet ground per wheel (avg.)	More work done per abrasive dollar

Summary-Flap Wheels vs Other Methods of Finishing *continued*

Operation	Flat Wheel Size, Grit, Mineral, Sequence, Etc.	Type Of Machine	Previous Method	Comparison		Results Comments
				Previous	Flap Wheels	
Descaling and cleaning cold rolled steel table bases prior to nickel plate	3" x 14" Grit 80 (for roughing); 240, 320 for finish. aluminum oxide	Swing grinder	Set-up wheels	Used six No. 60 set-up wheels to remove scale, 10 others to give platable finish.	3 flap wheels do complete job.	Reduced operations by 81¼ %— from 16 to 3
				5 hrs. per base	1 hr. per base	Slashed finishing time by 80%
Finishing vacuum cleaner lids of 20 ga. cold rolled steel for painting	4" x 16" grit 220 aluminum oxide	Floor lathe and 2-head rotary indexer	Set-up wheels	750 to 1000 lids per day	1500 to 2000 lids per day	Doubled production
				5 to 6 operators	3 operators	Reduced direct costs
					800 lids per wheel	Long wheel life; no reworks.

manufacturer produces a wheel up to 60-in. in width for special applications in polishing sheets or other broad surfaces.

Applications of Flap Type Wheels Are Varied

The area of application for this type of wheel, often called the "flap-type wheel," is very broad, ranging from light grinding with the coarse grits to high polishing with the fine grits.

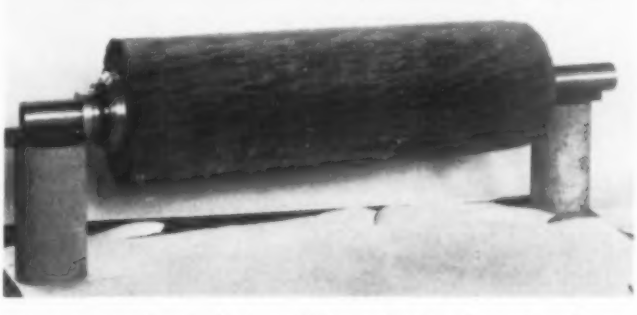
In the coarse grits, the wheels are ideal for smoothing and blending surface imperfections such as parting lines on die casting, "cold shut" marks, draw lines, blending rough-ground stainless weldments, smoothing soldered or brazed joints—in short, a wide variety of metal smoothing jobs where heavy grinding is not required and it is important to avoid flatting or digging into the surfaces. In addition, the smaller diameters used portably will work many areas unreachable with other types of abrasive tools.

The resilient nature of the wheel permits the easy control of the amount of stock to be removed. Essentially, however, this wheel is not a stock-removal tool. For grinding off heavy fins, deep draw marks, etc., the various forms of abrasive belt applications and/or setup wheels, and abrasive sleeve drums are unsurpassed—although the flap-type wheel is unsurpassed for surface blending after such tools are used.

Because of the absolutely uniform abrasive scratch achieved with the flap-type wheel, it is an effective tool when used in the fine grits for satin-finishing or pre-plating polishing operations. In this type of application, high quality polishes can be achieved while removing minor surface flaws such as light draw or moulding marks. But again, where surface imperfections are substantial, heavier abrasive equipment should be employed before the flap-type wheel can be economically used.

Grits Deliver a Finer Finish

The resilience of the individual abrasive leaves permits the grain to back away from the work surface on contact; the grain is not ground into the surface as it is where there is a rigid back-up surface, such as in the comparatively non-resilient setup wheels or abrasive belts running over contact wheels or platens. Consequently, the grain does not cut to its full depth and delivers a finer finish than would ordinarily be expected of a particular grit size. For instance, stainless steel sheets are usually "grained out" using a No. 150 grit for the finish cut in order to produce a Number 4 finish. In the flap-type wheel, a Number 4 finish is most closely duplicated by a No. 80 or No. 100 grit. Likewise, fine satin finishes of the type usually produced on instrument parts, watchcase backs, etc.,



48-in. face wheel, designed for polishing broad surfaces. Shown in slashed type for working contoured as well as flat surfaces. Wheel works high and low areas uniformly.

continue

At the recommended speeds, (which depends on the size of the wheel) the coated abrasive wheel offers complete safety for the operator, long life, and does its most effective cutting and polishing jobs.
Four factors that influence polishing and grinding wheel operations, and especially affect the quality of the finish obtained, are: type of abrasive mineral, pressure, speed and lubrication.

which are achieved by No. 280 to 320 grits, can be reproduced with the flap-type wheel using grits as coarse as No. 180 or 240.

Wheel Speed is Major Factor in Polishing

As in all polishing operations, speed is a major factor in the finish achieved. Roughly speaking, the higher the speed, the faster the cut and the finer the finish. But at the same time, too high a spindle speed means a harder wheel and less flexibility, and poorer wheel life since the high speed tends to disintegrate the abrasive cloth too rapidly. Rotational speeds as recommended by the manufacturers vary from 5000 to 10,000 sfpm, depending on the size of the wheel, grit grades, and applications.

In general, it may be said that the higher speeds are required for fine grit polishing (as in pre-plating operations), the lower speeds for satin graining, deburring, smoothing of surface flaws and similar applications which have more of a grinding character. With the smaller diameter wheels, rotational speeds are not as critical as with the large diameters, especially where the large diameters are used in automatic operations. The smaller diameter wheels, (the 6-in. diameter for instance) may be set up on portable tools or on pedestal grinders or bench arbors or motor shafts having standard constant speeds of 3450 or 3600 rpm's. These rpm's deliver an average surface speed of 5300 sfpm, which reduces up to 30% as the wheel wears down in diameter. The reduction in sfpm has no appreciable effect on the finishing action, however, because the operator is running a constant "eye-check"

Applications of Small Flap Wheels

Operation	Abrasive	Grit	RPM
1. Rust Removal	Aluminum Oxide	50	4500
2. Blending Stainless Steel	Aluminum Oxide	100	4500
3. Solder and Braze Blending	Aluminum Oxide	80	4500
4. Weld Blending - After Grinding	Aluminum Oxide	100	4500
5. ID Polishing - Stainless	Aluminum Oxide	80	4500
6. Applying Scratch Pattern (Aluminum)	Aluminum Oxide	50	4500
7. Applying Scratch Pattern (Stainless)	Aluminum Oxide	50	4500
8 Deburring Aluminum	Aluminum Oxide	60	4500
9. Sandcast Cleanup	Aluminum Oxide	100	4500
10. Flash and Parting Line Removal	Aluminum Oxide	100	4500
11. Kirksite Die Polishing	Aluminum Oxide	80	4000
12. Die Polishing	Aluminum Oxide	60	4500
13. Preparing Metal Surface for Enamel	Aluminum Oxide	60	4500
14. Breaking Wood Edges	Garnet	2/OJ	2000
15. Turbo Jet Blade Polishing	Aluminum Oxide	180	3500
16. Paint and Tar Removal	Aluminum Oxide	60	4500

Courtesy: Minnesota Mining and Manufacturing Co.

A rotary automatic operation combines two coated abrasive belts (left) and four wheels to finish sides of stamped aluminum frying pans. In "stopped" position note contour assumed by flap-type wheels, a shape which they will hold throughout their use on this workpiece.

on the finish he is producing and can instantly increase or decrease pressure of the wheel to compensate for loss of peripheral speed.

On the other hand, the larger diameters, when used on automatics, should be more closely speed-controlled since the dwell of the wheel and the pressure on the workpiece is predetermined and cannot be varied at will by the operator. In pre-plating polishing operations where an effective peripheral speed is approximately 7500 sfpm, a 16-in. diameter wheel would accordingly call for a starting rpm of 1800 with the speed varying upward as the wheel wears down to a diameter of between 8-in. and 10-in. in the worn out state. It is not necessary or desirable to maintain the exact sfpm of 7500 all the way, however. As the abrasive leaves wear down, the wheel loses resilience, becomes harder, and consequently naturally more aggressive. When the wheel has worn to a 10-in. diameter, an rpm of 2400 delivers a surface speed of only 6500 sfpm, but the comparative hardness of the wheel compensates for the peripheral speed loss.

Life of Wheels is Long

The extremely long life of these wheels makes them unequalled for many automatic polishing operations. Provided the workpiece requires only a moderate amount of wheel aggression, the life of a 14-in. diameter wheel, in grit ranges of 240 to 400, will run approximately 135 to 185 hours. Life of the coarser grit (No. 60 or 80 grit) wheels is somewhat shorter, ranging down to an average of 25 hours, more or less depending on the job. This seems sufficient where the particular resilience of the flap-type wheel is required and set-up wheels or belts cannot be substituted because of a particularly smooth finish requirement.

It is difficult to formulate exact standards for wheel speeds, grit grades, and length of life in automatic operations. The varying quality of the stock, the surface imperfections, part size and contour, and alloys are all controlling factors. Exact information in any particular application usually depends on test experience, although the manufacturers of this type of wheel can generally supply very close information.

The sequence on most pre-plating jobs of polishing deep drawn steel, for instance, may be this: Rough-polish heavy draw lines and severe imperfections with either abrasive belts or setup wheels of grit Nos. 80 to 180, depending on the amount of stock to be removed and its accessibility. This may be followed by a medium overall polish with flap-type wheels of

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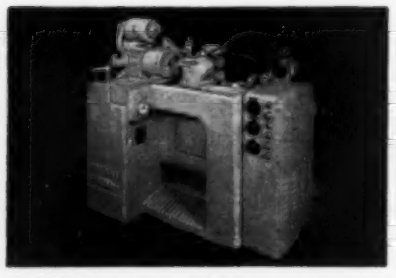
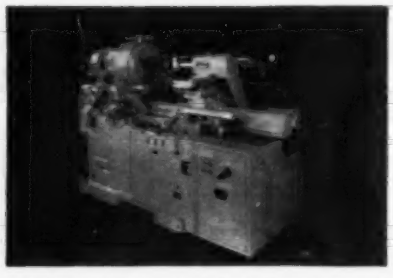
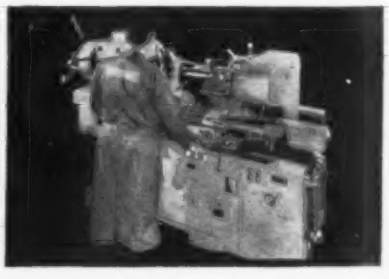
MODEL 1460 Hydraulically operated. Chuck swing of 60", total wheelslide stroke of 21"; maximum grinding stroke of 16".



MODEL 1109 A precision internal grinder, suitable for covering the range of smaller bore sizes. Total swing of 9"; maximum grinding stroke of 3½".



MODEL 1116 Tops for both toolroom and general production work. Total chuck swing 16"; maximum grinding stroke 8".



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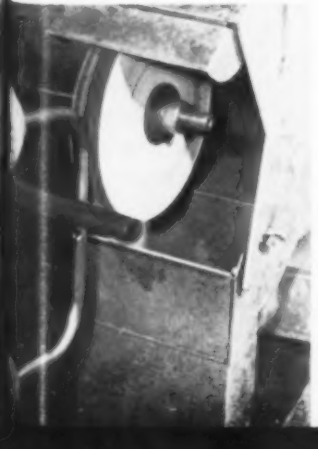
continued

In a 16-in. dia. wheel there are approximately 1,000 leaves of coated abrasive material, the exact number depending on the grit. These leaves measure 4-in. from the hub to the working edge. Laid end to end they total 4,000 inches or 330 feet of working abrasive surface. When the wheel is running at a speed of 1,750 rpm, the initial sfpm is about 7,300 and the abrasive leaves are contacting the work at the rate of 1,750,000 a minute.

Slashed type wheel, 14-in. diam., used on Hammond polishing lathe. Note how finger-like action enables wheel to flex to contour of workpiece.

At the St. Louis shops of the St. Louis-San Francisco Railway, small wheels are used for cleaning the tops of EMD cylinder heads. The wheel is 2½-in. x 6-in., grit 50 aluminum oxide. This method replaces wire brushes, which required twice the amount of time.



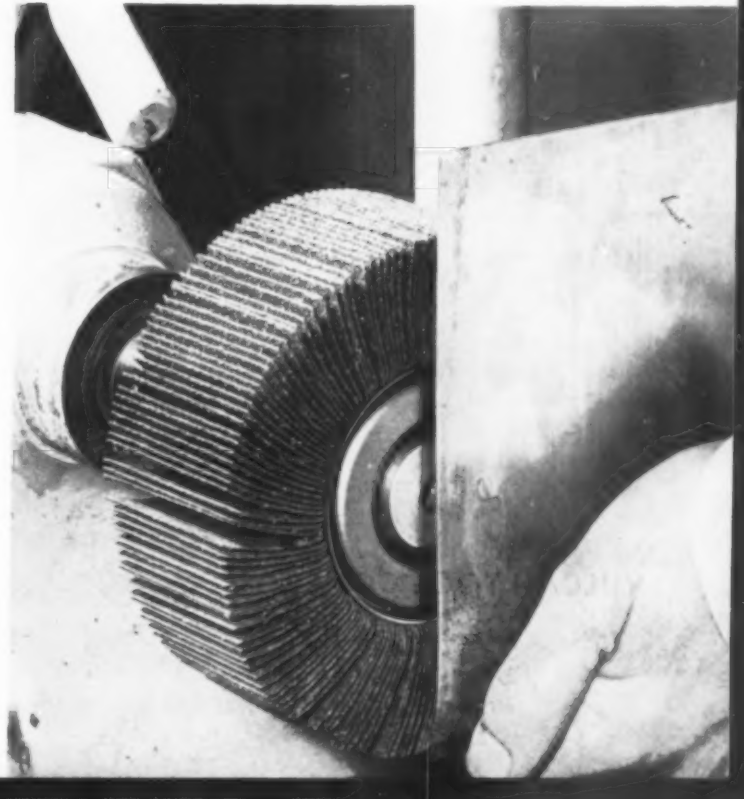
In an offhand operation, this stainless steel tubing is conditioned for plating on a 3-in. x 16-in. wheel shaped to the OD of the chair frame.

grit Nos. 150 to 240, and this medium operation may again be followed by the final polish with either sisal or cloth buffs or a combination of both. Type of sisal and compound used will also affect the selection of finishing grits in the flap-type wheel.

In non-plated finishes (aluminum castings are most typical), the flap-type wheel may be used up to No. 320 or 400 grit for the final finish, although sisal or cloth buffs are hard to beat where a bright polish is required. Likewise, buffs are generally indispensable in any pre-plating polish, except for cases where plating standards and procedures may permit plating directly on a flap-type wheel No. 320 finish. An automatic cycle might also even end with a flap-type wheel No. 220 or 240 grit if copper plat can be buffed and polishing lines be eliminated during this process.

The selection of the grit grade of belts preceding flap-type wheels in automatic operations is critical. The vast majority of rejects on such machines is due to the failure of the polishing heads to remove surface flaws or the development of "orange peel" from too many polishing passes. Both of these causes can be largely eliminated by the proper use of abrasive belts to remove as much of the flaw as possible and cut down the number of passes required. As a general rule, the belt or belts preceding the flap-type wheel should be 1) coarse enough to remove the imperfection and 2) fine enough so that the wheel can remove the scratches left by the belt. In some cases, pre-selecting particularly rough pieces for back-stand work before

Here is a close-up, still picture of a new small wheel with the recessed flange, showing how it can be used flush with a surface.



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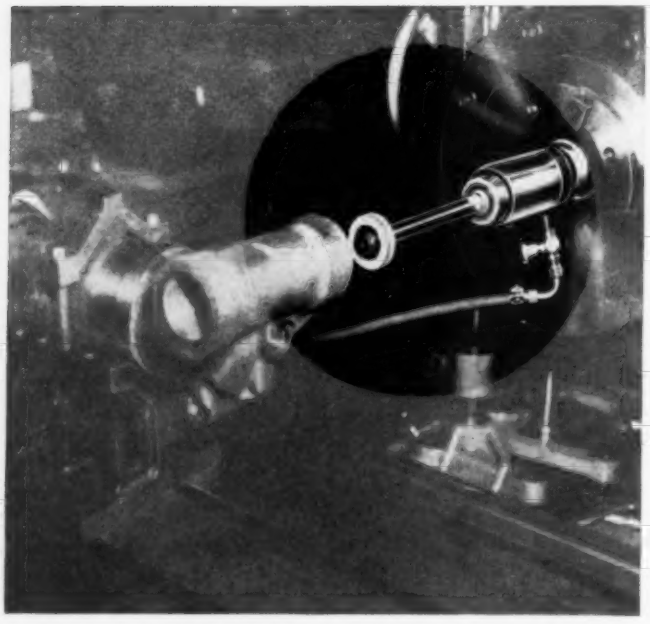

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being placed on the machine proves to be most economical. In others, an intermediate selection of rough parts is made for such back-stand work before the part goes through the finishing phases on the automatic line.

Abrasive Materials

Aluminum Oxide coated cloth is by far the most generally used abrasive, the silicon carbides being shorter lived and chosen mainly for working very hard non-ferrous metals or hard non-metallic surfaces which require a "brushed" finish of the type that the flap-wheels deliver. Tests on deep drawn steel parts show aluminum oxide to outlast the silicon carbides by 3 to five times.

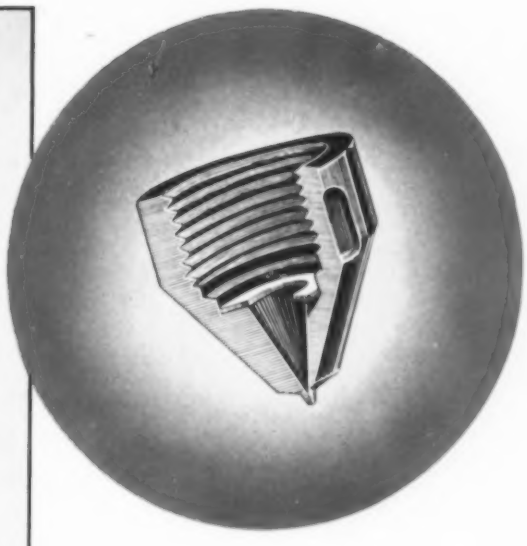
Profiling and Lubricating

Where a contoured work-surface is presented to the wheel in an unvarying position—that is, where the wheel is required only to work a certain contour continuously—profiling the face of the wheel is desirable, particularly on automatic operations. Once the profile has been cut, the wheel will wear constantly to hold the profile. In effect, the work surface itself constantly trims the wheel face. In cases where a wheel is required to work various surfaces of a contoured part where the contours presented to the wheel are constantly changing, profiling is, of course, not feasible. Slower surface speeds should be employed here to give the wheel greater flexibility to enable it to form to the changing contours. One wheel of this type is manufactured with slashed abrasive cloth, increasing its ability to conform to changing contours. Also, in automatic operatings, the increased flexibility of the slashed wheel reduces the shock on the wheel as the part is "wiped" across the face of the wheel. . . . Where profiling is practical, it can be accomplished by holding a coarse (24 or 36 grit) sharpening stone against the wheel face. Or a coarse piece of coated abrasive cloth may be wrapped around a block and used. Where many wheels are to be trimmed to a certain contour, a formed wood block is used to support the coated abrasive, or a vitrified silicon carbide stone may even be diamond-ground to the required shape. Where possible, the wheel should be run backwards as it is easier to dress the face by cutting the backing of the abrasive leaves first. Of course, a good deal of loose grit and debris will be thrown off during the profiling, and glasses and gloves are a necessity here, as well as a guard and suction system where possible.

In many polishing operations, the flap-type wheels should be properly lubricated to reach maximum cutting effectiveness. A pre-lubricated wheel has been developed which is impregnated with lubricant, evidently by soaking in a light cutting oil. Automatic spray equipment is also used to "shoot" the wheel during operation. In off-hand applications, the wheel face may be dressed occasionally with a low melting-point tallow stock. The effectiveness of lubrication shows up best on aluminum and stainless parts. • • •

Deburring and Cleaning
3 TIMES FASTER — and Better
by Liquid Honing with EXOLON FASTBLAST

Photo courtesy Vapor Blast Mfg. Co., Milwaukee, Wisconsin.



The almost microscopic holes in this Diesel fuel injector cup were deburred and cleaned by Liquid Honing with EXOLON FASTBLAST. And, best of all, it produced a smooth surface that promoted better fuel flow and cut down gum deposits — all at a saving of 87.5% over conventional methods.

If you have a finishing operation, let our technical and research staff estimate your savings by changing to this profit making method! Mail coupon below for fast service!

Liquid Honing is a method using EXOLON FASTBLAST (aluminum oxide) abrasive in particles so small they can be suspended in a slurry and thrown at high speed against the work to be finished. Scales, burrs, carbons, oxides are quickly removed — in fact one man and one machine equalled the former production of eight men using conventional methods in the deburring and cleaning of the Diesel fuel injector cup illustrated.

The rate of finish is controlled by varying the air pressure, abrasive size, type and concentration, blast angle and distance of nozzle from the work. The abrasive mesh sizes are usually 80, 100, 150, 180, 220, 240, 320, 400 and 600.

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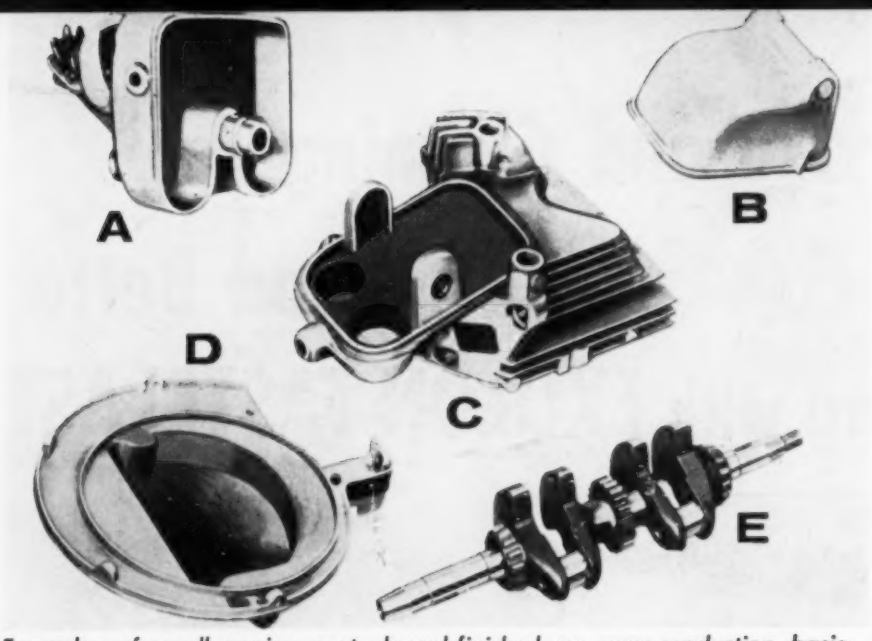

Examples of small engine parts barrel-finished on mass-production basis: A—Governor housing; B—rocker box cover; C—cylinder head; D—bearing cap; E—crankshaft.

Barrel Finishing Saves Money

DETROIT: Mechanical barrel finishing in the mass production of gasoline engine parts is playing an important role in the small engine division at the Detroit, Mich., plant of Continental Motors Corp.

Last June four barrel finishing machines were purchased. Two of these are 6-compartment units with a capacity of 20 cu. ft. per unit; two are 4-compartment machines, each with a capacity of 20.5 cu. ft. All are equipped with variable speed controls.

Percentage ratios on increased production—mechanical vs. hand finishing methods—are conservative and allow ample time for loading and unloading the machines. Covering several important engine parts, here are the findings:

Deburring a 2-throw crankshaft (SAE 1046 forged steel) with integral gear: 36 pieces per load, 25-minute time cycle, production up 300%.

Deburring a 2-cylinder crankcase and block (aluminum): six pieces per load, 17-minute time cycle, production up 50%.

Deburring a governor housing (aluminum): 128 pieces per load, 20-minute time cycle, production up 400%.

Deburring gear teeth and flyweight arms of governor flyweight carrier (ductile iron): 320 pieces per load, 60-minute time cycle, production up 500%.

Deburring an overhead valve cylinder head (aluminum with die cast Ampco bronze inserts): 36 pieces per load, 25-minute time cycle, production up 300%.

Deburring a rocker box cover (aluminum): 72 pieces per load, 20-minute time cycle, no increase in production. However, since the box cover is an exterior part of the engine and uniformity and quality of finish are vital to good appearance, this component is mechanically finished.

Following the barrel finishing process, the parts, many of them interchangeable in the three engines, go through final inspection and are assembled in the engine units. Equipment was purchased from Roto-Finish Co., Kalamazoo, Mich. • • •

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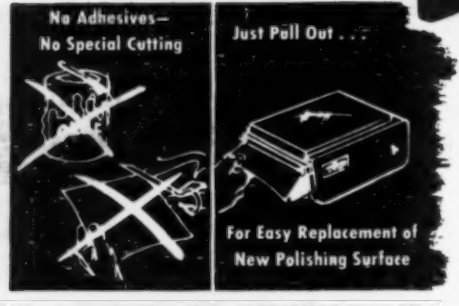

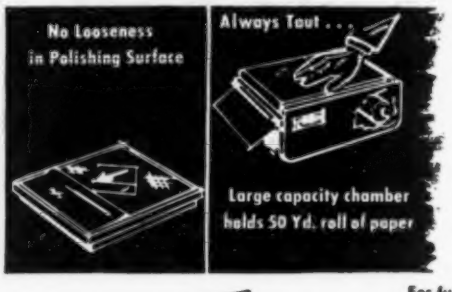

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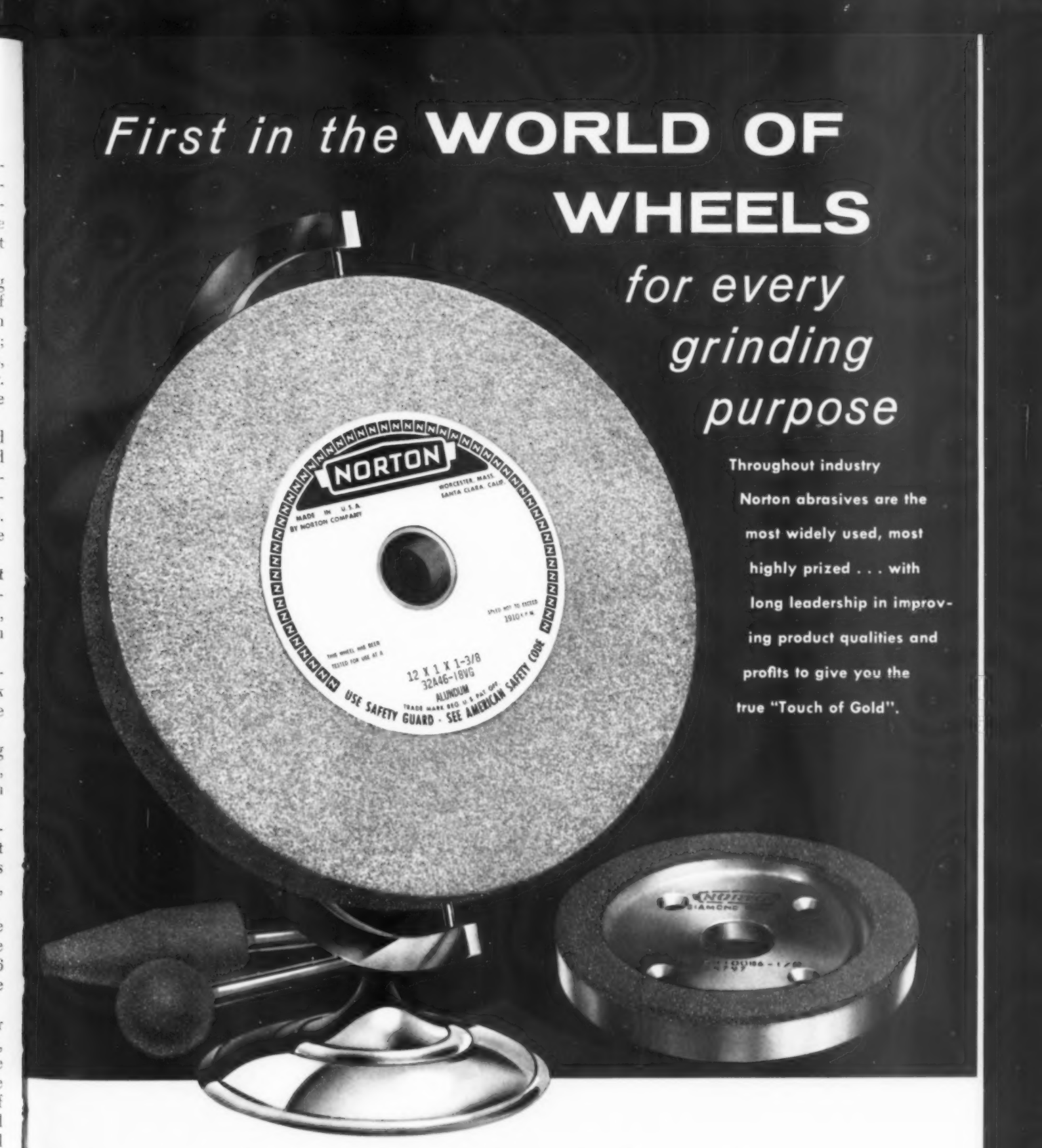

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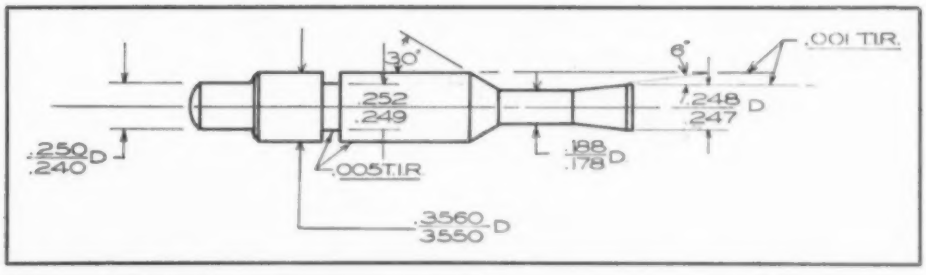

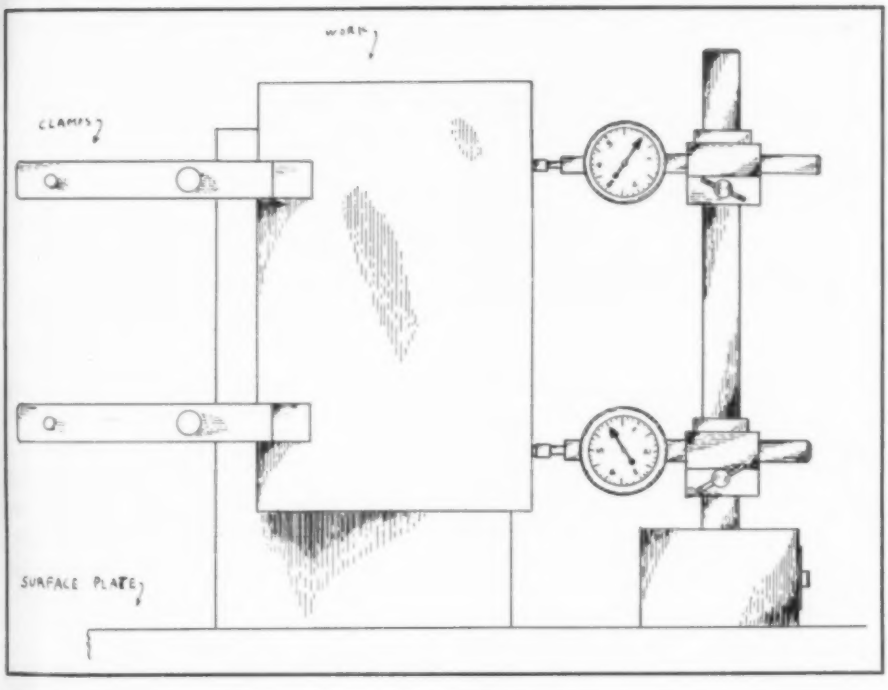

Checking for Square

By **William Martin**

• Surface grinding and squaring up of the edges of hardened steel die blocks requires a high degree of precision. Edge grinding is usually performed by clamping the work to an angle plate. A square is then placed against the vertical edge during the lapping to check for the angle. Either the use of a tool maker's square or the new cylindrical type square is time consuming and usually requires inserting paper between the square and the work to check contact.

Much of the time used for checking the angle can be saved through the use of two dial indicators mounted on a magnetic base stand. By bringing the indicators against an accurate square they can each be adjusted to a zero reading. Then by clamping the work to an angle plate the error in the angle of the die blocks will be indicated by the difference in the two readings as the indicators are brought against the blocks. The work may be lapped until the readings are the same. •

Profile Grind Replaces Turning Cuts Time and Costs

By **Clarence Siegrist**
and **Carl Broheimer**

• The part shown in the drawing above presented a problem to our company. The method of manufacturing was too slow and as a result its production was holding up assembly. This also put its cost above the original estimate.

The old method consisted of rough turning .248/.247 dia., forming 6° angle, .188/.178 dia. and 30° angle, moving stock to second stop and cutoff to 2.372 length, collet, groove .252/.249 form .250/.240 and 3/16" radius, centerless grind .3560/.3550 dia., collet on .3560/.3550 dia. and grind .248/.247 dia. holding .001 tir.

The method being used presently has doubled production and cut the cost to manufacture from $1.37 to $.70. The new method consists of cutting the material for two parts plus ⅛", profile grinding on a Cincinnati No. 2 centerless for all the diameters and the two angles, collet and cut to length forming the radius, and then form the groove. •

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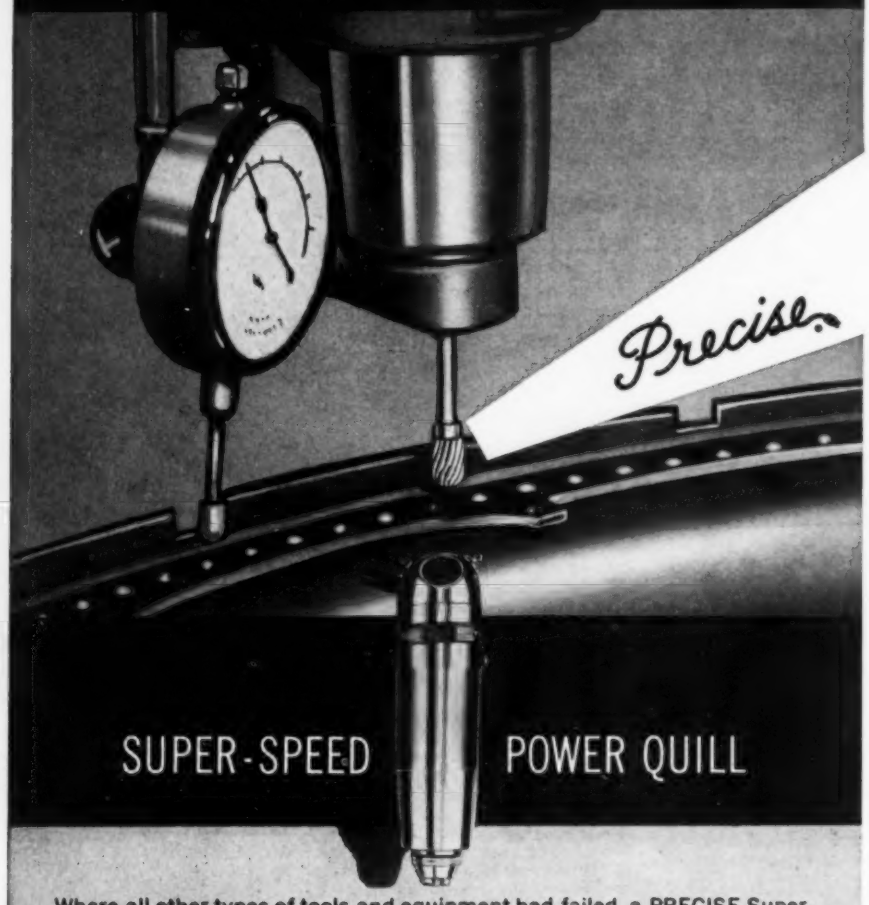
WITHOUT SHEET DISTORTION



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Change In Grinding Wheel Holding

By **Sam Bell**

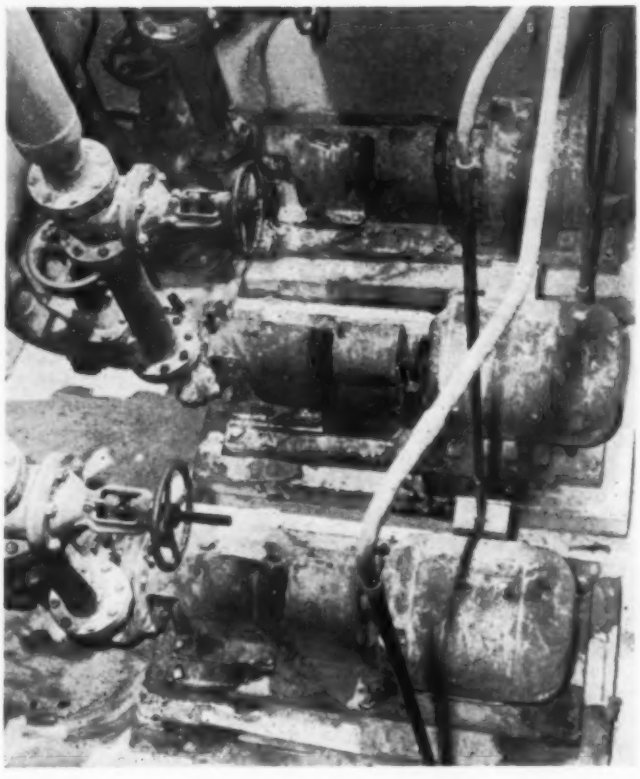
• For many years on our No. 11 Blanchard grinder, we used a 11 x 4 x 9 wheel which had 6—⅜ x 16 protruding studs, the latter being an integral part of the wheel. We grind 'backs' and other surfaces of hardened ring gears.

We bought a spring-type Blanchard Cyl. Wheel Holder, new guard and mounting board; total cost $138 (from Motch and Merryweather Co. in Ferndale, Mich.) which enabled us to buy 11 x 5 x 9 wheels without studs. Wheel cost—$10.80 net.

At current production output we would have used 25 of the 11 x 4 x 9 wheels at a yearly cost of $5472. Since wheel changing time took 25 minutes with stud wheel, naturally our piece-workers didn't want to bother with more than one specification of wheel. The difference in amount of stock-removal really called for two specifications being used, so now with Cyl. wheel holders change-wheel time at 5 mins. we use two specifications. Results were a yearly wheel rate cost $1552. Savings, $3920 yearly, plus better product, plus less strain on machine. •

"You distinctly said, 'put a guard on that wheel!' "

Pumps With Cast Stainless Impellers Resist Action of Grinding Coolant



These pumps, with type CN-7M cast stainless impellers, carry a mixture of ground glass and vinyl plastic particles in a dilute soapy solution, used in automotive glass grinding at Ford Motor Company's Rouge glass plant.

• Recirculating pumps with cast stainless steel components are now being used to resist extreme abrasion in automotive glass grinding at Ford Motor Company's Rouge glass plant in Dearborn, Michigan. Eight years' exposure to a mixture of ground glass and vinyl plastic particles, carried in a dilute soapy solution, have not affected the efficiency of these pumps; they are still operating and show no signs of needing replacement. According to engineers at this automotive company, three pumps have been in operation since 1950 and one since 1954.

Before the laminated body glass of automobiles and trucks is ready for use, the edges must be ground and polished. Because a considerable amount of heat is evolved during grinding, a cooling operation is necessary. To lift the coolant 25 feet to the machine nozzles at a discharge pressure of 20 psi or approximately 46 ft. head, DeLaval CPO pumps are employed. Continual recirculation contaminates the coolant with fine particles of vinyl plastic (used as the laminating binder) and ground glass. Since automotive body-glass edge grinding is a five-day operation, the contaminants settle out in pump lines, valves and tanks. This loading of the lines increases back pressure on the pumps, thus adding to their work-load.

DeLaval engineers have specified the use of grade CN-7M cast stainless steel (Alloy Casting Institute designation) for the pump impeller. Similar pumps have been installed at Ford's new Nashville, Tenn. glass plant. • • •

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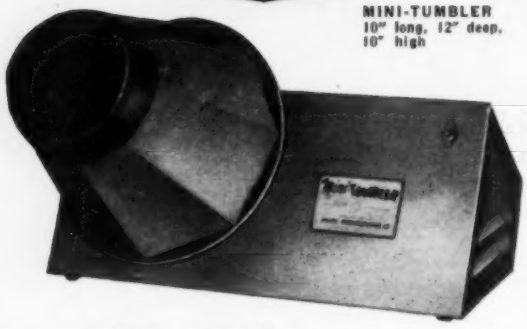

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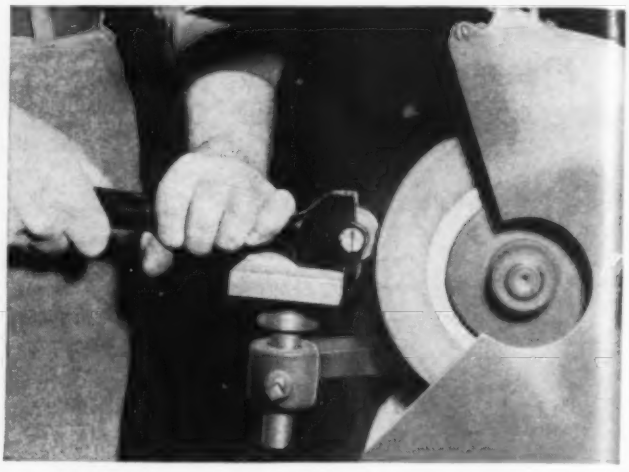

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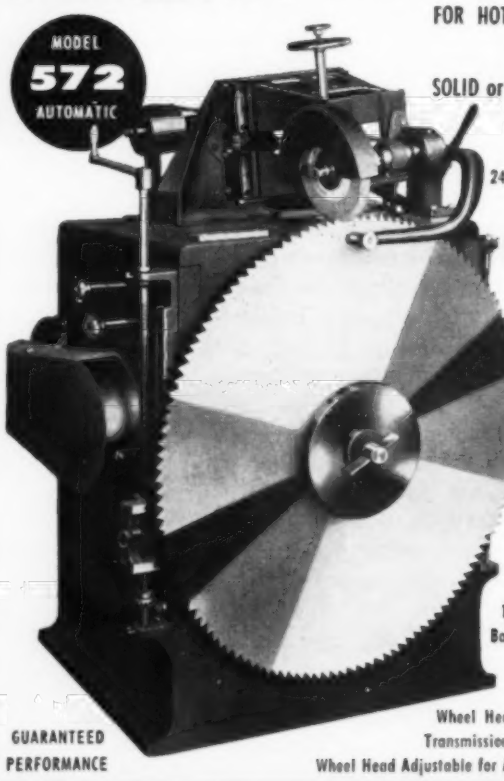

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Questions and Answers

By **Arthur Rakestraw**

● *What are the high and low surface speeds, which can be recommended for internal grinding of cast iron?*

Although the question does not state whether the interest lies in grinding wheel, or work surface speeds, we will assume that both are involved.

It is customary, with internal grinding set-ups, to select an abrasive wheel diameter, approximately the size of the cavity to be ground. When this wheel is mounted and trued for use, it will provide maximum wheel life.

The next step is to select the proper grinding head. Too often, the available wheel head is not of the proper speed rating that will provide the maximum recommended operating speed of the abrasive wheel.

The work driving mechanism is usually designed to permit a rather wide variation in work speeds, calculated to provide a suitable ratio between the abrasive wheel and the work. This ratio should be in the neighborhood of 65 to 1. Too high a ratio will result in glazing of the wheel face and elimination of cut.

It is essential that maximum wheel speeds be utilized for internal grinding because of the rapid reduction of abrasive wheel peripheral speeds with only slight reduction in wheel diameter. A loss of 1000 surface feet per minute is usually sufficient to cause the wheel to lose its efficiency, and the wheel should be discarded. •

● *What are the usual ways in which work is held and driven in internal grinding machines and what are the advantages and disadvantages of these methods?*

The type of work holding mechanism depends on the type of part to be ground, its shape and dimensional design. The customary multi-jawed air or mechanically operated chucks will take care of the heavy wall, cylindrical shapes whose inside and outside diameters are concentric. Many parts, whose outside dimensions are irregular, necessitate various work head fixtures and clamping mechanisms, with plug alignment for the inner diameter.

The part to be internally ground should be held securely but by a method that in no way will distort the piece. Its outer surface should be supported sufficiently to eliminate any possibility of distortion under the wheel pressures being used.

Work holding devices are selected, chiefly with the purpose of rapid and accurate duplication of hole sizes. Improper holding devices will prove to be costly in that the duplicating of dimensional accuracy will not be possible.

● *What should be considered in selecting a wheel for off-hand grinding of combination carbide and steel tools?*

When off-hand grinding a combination of carbide and steel, it is necessary to favor the more sensitive of the two metals, which is carbide. Abrasive wheels, made up of silicon carbide grain, will be found best adaptable. Such a wheel is not well suited to steel alone, but due to the characteristic grain shape, will remove carbide with a lesser tendency to generate heat cracks. •

● *What is the relationship of traverse speed to work rotation on cylindrical grinding of hardened steel?*

The amount of abrasive wheel traverse per revolution of the work depends largely on the rigidity of the part as regards to its resistance to possible deflection, amount of infeed, and grinding ability of the wheel. The greater the rate of traverse, the greater the wheel contact and wheel pressure on the work. On small diameter, long work pieces, the resultant part deflection would preclude any possibility of performing a satisfactory finish, unless the part were backed up by work rests. Without work rests, traverse rate and infeed would necessarily be reduced to a minimum.

Because of the wide variation in abrasive wheel sizes and in the cylindrical work to be produced, it would be difficult to establish a definite traverse rate. In general, the maximum wheel traverse should not exceed one half the wheel width, per work revolution, on roughing cuts. A very slow traverse would be used for the finishing pass. •

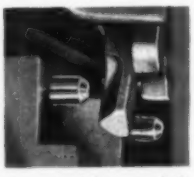
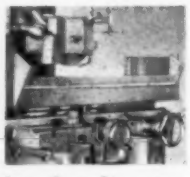
● *What advantage is there in using a sandwich type wheel for cut-off of cast iron?*

By sandwich type, we assume that you have reference to cut-off wheels into which has been built one or more layers of re-inforcing material, designed to strengthen the wheel against breakage.

The advantage, of course, in using a wheel of this type, is in the elimination of possible accidents, caused by flying wheel sections, in the event of breakage. Wheel breakage is more frequent in cut-off operations than in most grinding operations. It is not always possible to guard the wheel in a manner to completely enclose it and safe guard the operator against fragments of broken wheel. The re-enforcement in the sandwich wheel adds considerably to its safe usage. •

and now . . . Abrasive "operator engineering" brings you —

AUTOMATIC CYCLING ON SURFACE GRINDERS

Grind precision work to size — *automatically* — like this: Simply set this down-feed increment from .0001" to .0025". Then, the head automatically down-feeds that amount each time these adjustable trips  reverse the saddle, or if you wish, each time this table control reverses the table. When this micrometer stop, which you have set to finish size, contacts this micro switch, the down-feed knocks off and this red light flashes on. Then, depending upon how you have set this control, the grinder will automatically spark out 1, 2 or 3 times. Abrasive's cost-cutting automatic cycling is available on all Hydrabrasive precision surface grinders  which are illustrated and described in this colorful brochure. *Write for it, now!*

ABRASIVE MACHINE TOOL COMPANY

East Providence, Rhode Island.

gf ... wherever abrasive operations are performed

Free Literature

Use the postpaid card opposite page 72 to receive your copy of any of the literature listed on these pages. Just circle the proper number on the card which coincides with the number which precedes the paragraph. We'll do the rest.

1. **Dual Manifold Filtration.** A 4-page bulletin describes the operating principles, filtering efficiency and applications of the Delpark Dual Manifold Filter-Matic Filter. Three type are described: the tubular screen filter, the leaf type filter, and a unit designed for the removal of foam borne solids. Applications are in the filtration of coolants and cutting oils. Industrial Filtration Co., Lebanon, Ind.

2. **Cylindrical Grinding and Indexing Attachment,** the No. 616, is designed for dry grinding small cylindrical work, and work requiring indexing on surface grinders. Work driving dogs hold work without backlash, when indexing is required. Other features reported are settings for angular work made easily, tailstock quickly removed, and collet holding face plate quickly installed. Explanatory folder available from Henry Owens & Co., Inc., 51 Washington Ave., Cranston 7, R.I.

3. **Magnetic Automatic Separator.** A recent brochure reports the separator as extremely effective in the continuous removal of ferrous metal solids. It uses the ever-flowing energy of permanent magnets that attract the solids to a revolving magnetic drum. The separator can be adapted to fit existing coolant tanks or systems. It features a full range of capacities—1 to 2000 gpm. There are two types—drum and belt type. Infilco, Inc., Tucson, Ariz.

4. **Air Gaging Cartridges.** Where and how to use Plunjet air gaging cartridges in single and multiple dimension gages and inspection fixtures is described and illustrated in 32-page catalog No. PGC-58-1. The items are pneumatic size-sensing pick-up units for use with Sheffield Precision-aire gages and other type of air gages. Complete engineering specs. and typical applications are included. The Sheffield Corp., Dayton 1, Ohio.

5. **"Cincinnati Cutoff Wheels"** is the title of booklet No. PG-336, which describes these wheels and the characteristics of the three bond types in which they are available: resinoid, rubber, and reinforced resinoid. A helpful section devoted to good cutoff practices and a table of suggested gradings for cutoff operations are also included. Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

6. **Production Honing.** "Auto-size" honing gives consistently accurate, geometrically true bores—straight, round and uniform—in less than one-fourth the time formerly needed, according to brochure. The completely automatic control of spindle speed, stroke and stone pressure through both roughing and finishing cuts is said to minimum cycle time. The capacity is: 8" length of bore, $\frac{3}{8}$" to $2\frac{1}{2}$" diameter of bore, and up to 10 lbs. weight of piece part. It has 6" stroke, $\frac{3}{4}$ hp spindle motor. National Pioneer, Inc., 5700 W. North Ave., Chicago 39, Ill.

7. **Material-Handling Equipment Wheel,** polyurethane-tired, and called the Disowheel, is featured in 4-page folder. It describes the wheel's load carrying capacity, resilience and abrasion resistance. Marketing Services Dept., Disogrin Industries, Inc., 510 S. Fulton Ave., Mt. Vernon, N.Y.

8. **Three-Dimensional Milling and Machining** at production rates up to one part every 18 seconds is described in brochure. It shows typical two work-station machine, and development of space configurations through hydraulically actuated cams. Tri-Ordinate Corp., 335 Snyder Ave., Berkeley Heights, N.J.

9. **"Foreign Licensing, Questions and Answers"** is title of a booklet prepared as a service to American manufacturers who may be considering the licensing of their products overseas, or who are interested in knowing more about this form of business arrangement. Pegasus International Corp., 1 E. 53d St., New York 22, N.Y.

10. **Lapping Oil.** Super Diamoil is a cooling, lubricating and cleaning fluid. It is said to double or even treble the life of diamond wheels and wire drawing dies. The fluid protects tools against corrosion also. It is reported to save costs by reducing grinding time, increasing grinding effect, and cleaning diamond wheels, according to flyer. Merrick International Corp., 225 Lafayette St., N.Y. 12, N.Y.

11. **Metal Solder.** Technical data sheets give various aspects of Lab-Metal, which consists of aluminum, an organic stabilizer and solvent. It is a multi-purpose repair

(See Number 1)

(See Number 4)

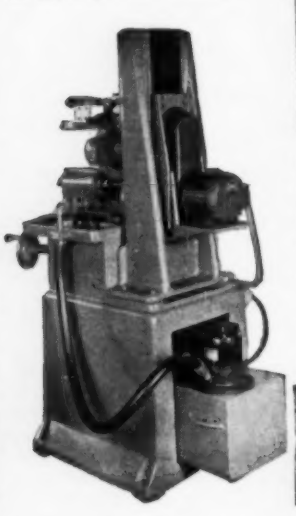
(See Number 5)

DALZEN

THREAD GRINDER

- AVERAGE SET-UP TIME 30 MINUTES!
- SAVES FLOOR SPACE!
- LOW COST!

Excellent for tool room and production Thread Grinding. Easily set-up from job to job! Has built-in relieving attachment as standard equipment for grinding of taps. This remarkable machine may also be used to grind angles, grooves and surfaces where concentricity is an important factor!



Dresser and wheel head are self-compensating. Size of work is automatically maintained after dressing of wheel regardless of how much is dressed off.

The grinding and regrinding of thread rolls up to 3" in diameter and thread milling cutters can also be ground with special attachment.

Photo shows just a few of the many jobs done on the DALZEN THREAD GRINDER

2 in 1 COMBINATION CENTER GRINDER & DRILL PRESS

A drill press and center lapping machine at less than the cost of many single purpose center grinders! In addition to savings on equipment costs, the Dalzen "2 in 1" permits maximum man-hour production thereby keeping your unit cost at a minimum!

1 SIMPLE OPERATION CHANGES CENTER GRINDER TO DRILL PRESS

Center grinder to drill press or drill press to center grinder in a matter of seconds! Simply unlock clamping handle and swing diamond dresser in or out of position! Photo at right shows center grinder at work.

A full 43" capacity from base to spindle . . . dresser adjustment from 20° to 100° included angle . . . drills to center of 15" circle . . . maximum lapping stone dia. 3".

WE ALSO SPECIALIZE IN THREAD ROLLING DIES AND THREAD HOBS LITERATURE ON REQUEST

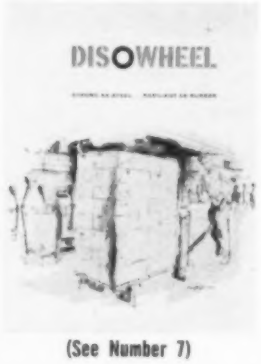
DALZEN MANUFACTURING CO.

4600 BREE ROAD DEPT. GF-6

ST. CLAIR, MICHIGAN

FREE LITERATURE *continued*

material which goes on cold and hardens to a permanent metal bond. The solder is usable for storage tank, pipe and vehicle maintenance, and truck, bus, railroad construction and repair. Alvin Products, Inc., Worcester 4, Mass.



(See Number 7)

12. Environmental and Electronic Testing is the subject of brochure. The organization is prepared to ascertain the stability, stamina, ruggedness and functional performance of the customer's product. For evaluation of equipment, the laboratories

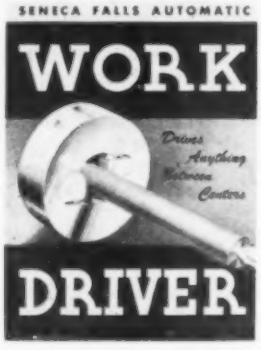
are thorough, complete and fully diversified—even to simulating desert, tropic, arctic and stratospehric conditions. New York Testing Laboratories, Inc., 47 West St., N. Y. 6, N. Y.

13. Throwaway Tooling. In practical terms, booklet released outlines how the user may obtain maximum throwaway tooling results through the proper use of correct style holders and inserts. Feature sections include "Nine factors determining the

proper selection of a mechanical toolholder and insert," "Guide to grade selection," etc. Adamas Carbide Corp., Kenilworth, N. J.

14. Work Driver. Bulletin D-57 describes the work driver for use on any type of

engine lathe, multiple tool lathe, or plain or universal grinder. It has serrated jaws milled at an angle to grip work better.



The driver is designed to eliminate dogging time and increase productivity. Sizes for work diameters from ¼" to 6⅞" are included. Seneca Falls Machine Co., 13 Fyfe Bldg., Seneca Falls, N. Y.

15. Automatic Infeed Grinding Attachment, the Feedcision, is reported to give utmost precision in centerless grinding and duplicate sizing. Colorful brochure states maximum stock removal in one pass is .040". Sizing dial is graduated in

.00001. The unit has three different feed rates: Rapid feed up to the piece part, intermittent feed for faster and more efficient grinding, and a fine feed for rounding of the piece part. Instructions as to installation are given, with blueprint of the parts. Modern Devices, Div. 20th Century Mfg. Co., Box 429, Libertyville, Ill.

16. A Map Depicting Standard Time Zones of the United States and Canada is being offered free of charge. It is printed in three colors on 8½" x 11" card stock. Ohio Seamless Tube Div., Copperweld Steel Co., Shelby, Ohio.

17. Switching Reactors. A 16-page catalog, S-10, has been issued on the company's complete line of standard switching reactors for one-step, low-cost static control. Adaptable to either a-c or d-c use,

MURRAY WAY "PROVED RIGHT" EQUIPMENT AND ENGINEERING EXPERIENCE ARE THE ANSWER TO YOUR POLISHING, BUFFING AND GRINDING NEEDS.

Whether you need a single, standard polishing head or a specially engineered, fully automatic production line with all the trimmings, Murray-Way can do the job better, more reliably, for greater operating efficiency.

You are invited to consult our engineering staff about your finishing problems.

MURRAY WAY CORPORATION
P. O. BOX 180, MAPLE ROAD EAST BIRMINGHAM, MICH.
Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.

FREE LITERATURE *continued*

(See Number 17)

(See Number 20)

(See Number 21)

the Control units perform all logic functions, and are applicable to switching and sequencing installations. The two types of units described are offered in 15, 75, 150, and 300 VA ratings. Control, Div. of Magnetics, Inc., Butler, Pa.

18. Electric Fork Truck Preventative Maintenance Chart that enforces time- and money-saving maintenance practices is now available free. Besides offering efficiency tips, the chart pin-points 28 specific areas to be inspected daily, weekly or monthly. Lewis-Shepard Products, Inc., 125 Walnut St., Watertown 72, Mass.

19. New Computer Design Techniques, to accomplish substantial savings throughout engineering development programs for electronic digital computers, are described in booklet. It also relates the firm's use of a family of general-purpose digital building blocks, and explains the company's application of advanced computer-aided design methods. Control Data Corp., 501 Park Ave., Minneapolis 4.

20. Segmental Grinding Chucks. Folder pictures the AA grinding chuck with a new grinding action, featuring AA1 grinding segments. The segments are placed in a circular echelon formation so as to cut with a sweeping action, which automatically eliminates chips. The abrasive segments are also quickly installed, and rapidly adjusted as worn down. Of advantage also is the high cutting efficiency of the chuck which permits using solid, safe segments on hardest steels. Standardization enables one segment to cover most vertical spindle surface and horizontal spindle face grinding requirements. Tables and specs. included. Abrasive Associates, 200 Shepard Ave., Hamden, Conn.

21. Magnetic Coolant Separators, in capacities of 25, 50, 75 and 100 gpm, offer completely automatic coolant cleaning, and are easily installed on numerous types of grinding, honing and gear-shaving machines. The small, compact unit cleans a relatively high volume of fluid, according to leaflet available. It does not clog or require shut downs for cleaning or sludge removal, and sump cleaning was eliminated, were advantages given. Sundstrand Machine Tool Co., Magnetic Products Div., 2531 Eleventh St., Rockford, Ill.

22. E6 and V6 Housings, an improvement in the Micro Switch E and V type die-cast enclosed switches, are described in two-page data sheet 145. Shown are the added ruggedness and ease of wiring gained with no increase in size. Micro Switch, Div. of Minneapolis-Honeywell Regulator Co., Freeport, Ill.

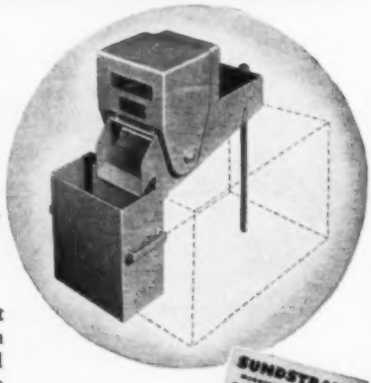
23. Gang Fixture, Model GF-2, has built into it a number of features for accurate, efficient milling and grinding a number of pieces at the same time, according to flyer available. Compensating jaws clamp each workpiece with equal pressure, and springless clamping is said to be positive and constant. All parts are ground to ten-thousandths, and adjustable work stops are provided for accurate gaging. Specs. and price are given. Lassy Tool Co., Plainville, Conn.

24. Wave Measuring Instrument. The Wavometer is an instrument for measuring waviness on symmetrical surfaces of rotation. It will handle ID's and OD's of surfaces up to 18" diameter, and provides for angular adjustments of 30° above horizontal to 70° below. It gives the meter reading of the rms average height of the waves in two wavebands, directly in microinches (millionths of an inch). Flyer is obtainable from Micrometrical Mfg. Co., 345 So. Main St., Ann Arbor, Mich

$1927.12 SAVED PER YEAR

...with Sundstrand Magnetic Coolant Separator

Installation of a Sundstrand Magnetic Coolant Separator on a grinder, as shown above, resulted in a yearly saving of $1927.12. Further, instead of cleaning the coolant tank twice daily, it now requires cleaning only *twice weekly*. Cost of the installation is approximately $495.00. The unit requires no attention and little or no maintenance.



Easily Installed Without Additional Piping

An important feature of this magnetic coolant separator is that it can be dropped into position on most open type coolant tanks. No additional piping is required. Install one on your present equipment and compare its efficient operation with other units.

Free Additional Data

This folder will give you the complete facts on the Sundstrand Magnetic Coolant Separator. Write for your copy today. Ask for bulletin 392-M.

SUNDSTRAND

POWER-GRIP

SUNDSTRAND MACHINE TOOL CO.

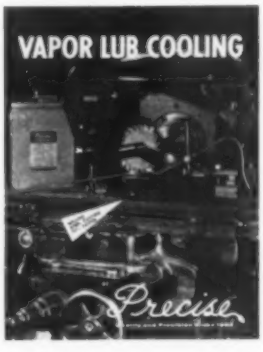
Magnetic Products Division

2531 ELEVENTH ST., ROCKFORD, ILLINOIS

25. **Separator Conveyor.** The Magneflex serves a dual purpose. As a magnetic separator it is used for magnetic cleaning of coolant and cutting oils. Without the magnets, it becomes an efficient sludge and chip conveyor—the Flexi-Flight. Flyer from Infilco Inc., Tucson, Ariz.

26. **Sleeves, Boots, Way-Protectors and Machinery Covers.** Flyer speaks of them as operating in angular, horizontal or vertical positions. The parts are made from a neoprene-base material, said to be impervious to oil, grease and water and able to withstand temperature extremes 60° below zero to 220° F. without cracking. A & A Mfg. Co., Inc., 712 S. 12th St., Milwaukee 4, Wis.

27. **Coolant Brings Refrigeration** to metal working. Vapor Lub, described in literature, is a trouble-free system of cooling which gives improved surface finishes



and allows high speeds and feeds. Compressed air expands through the nozzle tip, absorbing heat, as the coolant deposits lub particles on tool and work at the same time. The unit is said to be effective on grinding, drilling, tapping and metal drawing operations. Precise Products Corp., Racine, Wis.

"Never see a work rest before?"

AIR IN MOTION KEEPS MEN IN MOTION

Dusty or fume-laden air can curtail production and increase maintenance costs by dulling worker efficiency and damaging bearings, motors . . . even machines.

Efficient K & B Dust Control Systems put AIR in Motion to become an important production tool.

In the plant of a noted chain and forging firm, an official made this comment about a new K & B installation: "Our workmen can now work full time . . . this means added production for them and for the company as well."

Call on K & B engineers to put *AIR in Motion* and help boost your plant efficiency. The Kirk & Blum Manufacturing Company, 3124 Forrer Street, Cincinnati 9, Ohio

K & B system serving castings grinding removes dust, sand and chips as fast as they are produced. Work revolves on turntable to enable operator to work continuously.

50 YEARS OF SERVICE

KIRK & BLUM

DUST CONTROL

K & B Down Draft Dust Control System in plant of The Monarch Machine Tool Co., Sidney, Ohio

gf ... wherever abrasive operations are performed

New Equipment and Materials

For further information on any of the products listed here, use the handy postpaid card opposite page 72.

Honing Machine Features Automatic Sizing for Accuracy

Automatic electronic control of spindle speed, stroke and stone pressure based on continuous in-process air gaging of the bore being honed is feature of this machine. Air gage orifices are an integral part of the mandrel itself. Stone feed-out in the precision, rigidly mounted mandrel is

reported as also controlled and positive. The same stones are used for both roughing and finishing, eliminating the need for separate operations. The "auto-size" honing gives consistently accurate, geometrically true bores—straight, round and uniform—in less than one-fourth the time formerly needed, according to the firm.

The easy-to-read dial indicator shows actual bore size continuously during the honing operation.

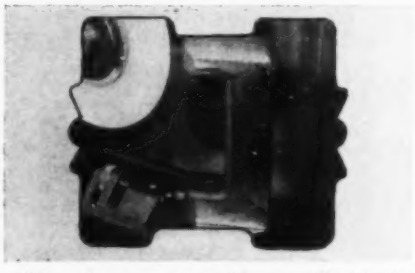
The capacity is: 8" length of bore, ⅜" to 2½" diameter of bore, and up to 10 lbs. weight of piece part. Specifications are: 6" stroke, ¾ hp spindle motor, built-in oil filtering system, and ten gallon coolant capacity.

National Pioneer, Inc., 5700 W. North Ave., Chicago 39, Ill.

Use postpaid card. Circle No. 101

Grinding Wheel Dresser

The Pronto has the advantage of moving freely when the magnet is on, and the templates can be used repeatedly.



The dresser is said to effectively duplicate the shape of a template to a grinding wheel. Grinding results obtained are reported to be clean, sharp and chatter-free.

Diamond template holder and one template .062 radius included.

Progressive Tool & Mfg. Co., 1303 W. Jackson Blvd., Chicago 7.

Use postpaid card. Circle No. 102

Bonded Diamond Abrasive Helps Prevent Wear on Radiused Grinding Laps

A new application for bonded diamond abrasive has effected considerable savings in labor cost on certain close tolerance lapping operations, according to the firm.

A large manufacturer of electric shavers is reported to have realized a saving of two cents per part with this method, which is used to produce thousands of shaver heads daily. Cast iron laps formerly used on this operation lost their shape after five or six parts, necessitating expensive regrinding to tolerance to allow for the critical radius requirements.

Sample Marshall Laboratories is now supplying lap rods with a layer of bonded diamond particles, in high concentrations, dulled to form a myriad of bearing surfaces conforming to the close tolerance required. As the steel parts being lapped are too soft for economical grinding with diamond abrasive, a slurry of carborundum is used to do the actual lapping, while the diamond serves only to retain the shape of the lap rod over months of use. Downtime is now kept to a minimum since costly lap rod regrinding is no longer required.

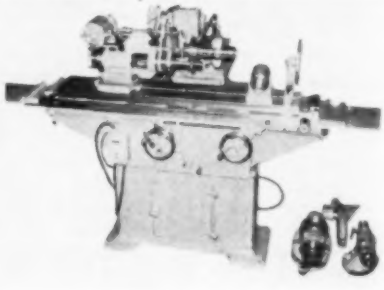
Sample Marshall Laboratories, Inc., 63 Park Ave., Lyndhurst, N.J.

Use postpaid card. Circle No. 103

Machine to Grind Carbide Throwaway Tools

A machine has been designed to grind carbide throwaway tools in various applications. It is said to grind the entire periphery of the throwaway, including the radius in one operation. The radius is ground perfect tangent with the sides. The sides are flat and parallel within .0002.

The machine will grind any shape tool, including squares, triangles, pentagons, diamond shapes and rounds.



It will grind negative and positive rake tools and will hold a .0005 tolerance on production, and also grind used throwaway tools so they can be used again.

The Harvill Machine Co., 618 East 10-Mile Rd., Hazel Park, Mich.

Use postpaid card. Circle No. 104

Multi-Table Speeds Dressing of Grinding Wheels

Wheelabrator multi-table is reported to clean twenty-one 6" diameter grinding wheels in the time three wheels could be dressed formerly. The unit

Metal removal *faster* at lower cost

CHICAGO
MOUNTED WHEELS

Prompt Out-of-Stock Deliveries

There is a precision-engineered Chicago Mounted Wheel or point for every imaginable grinding operation. Ideal for efficient, effective deburring. . . . Always available . . . in all standard sizes, and over 200 special shapes, for out-of-stock delivery. Save Time – Money – Materials . . . Specify Chicago Mounted Wheels!

Every Chicago Mounted Wheel is produced under positive production control...assuring perfect uniformity of mounted wheels and points. There is no variation from one production run to another.

Positive density control for peak job performance

Guaranteed to stay on the mandrel . . . perfectly balanced

Chicago Mounted Wheels are easily dressed and hold their shape

Unlimited number of combinations of dimension, shape, grain, size and bond

WRITE FOR *Trial* CHICAGO WHEELS

Test them yourself!

Send coupon for two Chicago Mounted Wheels . . . Test one against the other . . . you'll see the meaning of true uniform performance!

G-6

CHICAGO WHEEL & MFG. CO.
1101 W. Monroe Street • Chicago, Illinois

Send me two sample Chicago Mounted Wheels without charge:

Name _____

Address _____

City _____ Zone _____ State _____

also produces a sharp grinding surface by removing all undesirable filler without disturbing the abrasive grains.

Material wasted in molding grinding wheels oversize to allow for dressing is now saved. On the 6" wheels shown, this amounts to a 15% saving.

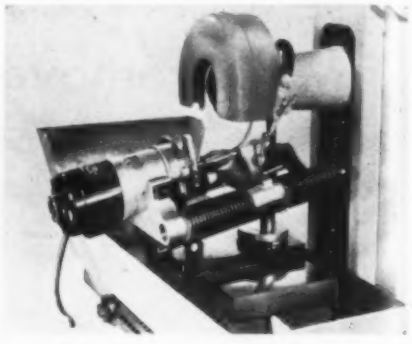
Wheelabrator Corp., Mishawaka, Ind.

Use postpaid card. Circle No. 105

Cylindrical Grinding Attachment

A cylindrical O.D. dual-purpose grinding attachment uses true dead centers which assure concentricity to .0001 total indicator reading, according to the firm. It is also designed to serve as an inspection instrument.

Important features are a built-in sine plate and micrometer which permits grinding and inspection of tapers within



seconds of an arc, spring loaded tail stock centers that also contribute to unusual accuracy, and a micrometer range from .025 minus to .025 plus which eliminates the need for an expensive set of gauge blocks.

Gebhart Machine Tools, Ltd., 1608 Victory Blvd., Glendale, Calif.

Use postpaid card. Circle No. 106

Small Wheel Grinder Enables Plants to Do Own Resharpening

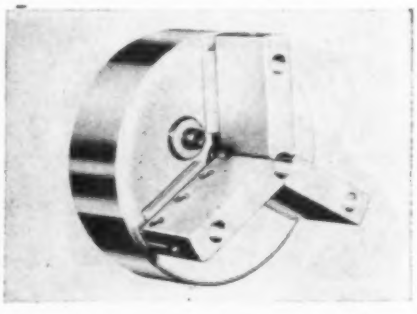
A bench model grinder, designed for sharpening pipe and tube rotary cut-off wheels, has a manual bevel adjustment and set screw stop that permits exactly equal length bevels on both sides of the blade. The adjustable base compensates for grinding wheel wear.

Plants sending wheels of this type outside can now save by doing their own regrinding.

The grinder sharpens 4½" to 8" wheels. An adapter is available for wheels smaller than 4½" diameters. Price of the unit is $290 f.o.b. plant.

Continental Machine Co., 2345 W. Nelson St., Chicago 18, Ill.

Use postpaid card. Circle No. 107



Diaphragm Chuck for High Speed Precision Boring

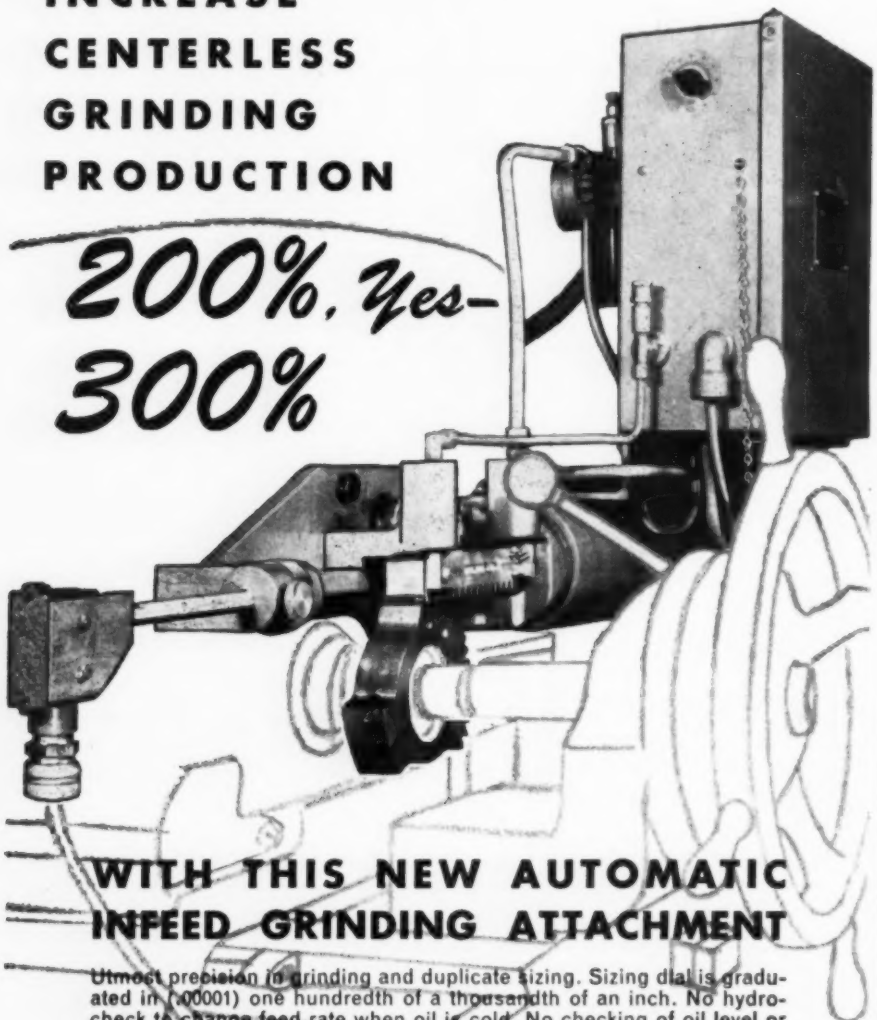
The air-operated chuck SC 401, is said to assure consistently controlled concentricity at spindle speeds up to 5000 rpm. Recommended part range is from ⅛" to 3" diameter. Designed for high speed precision boring or grinding on single and multiple spindles, the chuck has three adjustable jaws and fixed stop facilities.

N. A. Woodworth Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

Use postpaid card. Circle No. 108

INCREASE CENTERLESS GRINDING PRODUCTION

200%, Yes— 300%



WITH THIS NEW AUTOMATIC INFEED GRINDING ATTACHMENT

Utmost precision in grinding and duplicate sizing. Sizing dial is graduated in (.00001) one hundredth of a thousandth of an inch. No hydrocheck to change feed rate when oil is cold. No checking of oil level or refilling of hydrocheck. Three (3) different feed rates are available in one unit for the fastest, most efficient, and precise sizing in a centerless grinder.

CAN BE USED FOR TRU-FEED AS WELL AS INFEED

for close sizing. Ideally located push button control station consists of Stop-Button, Start-Button, Caution Pilot Light, and a selector switch for set up or auto grinding positions. CATALOG Write for it today!

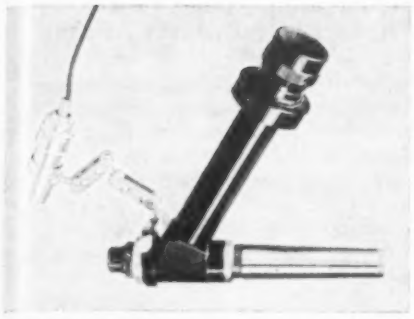
MODERN DEVICES

Subsidiary of TWENTIETH CENTURY MFG. CO.

FEEDCISION

Box 429 GF Libertyville, Illinois

Open Territories for Manufacturers' Representatives



LOCATING MICROSCOPE in jig borers and similar precision machine tools. Optically it combines at 25x total magnification a fairly large field with sufficient power of observation. Standard shanks are ½" straight, No. 2 and No. 3 Morse Taper. Opto-Metric Tools, Inc., 137 Varick St., N.Y. 13, N.Y.

Use postpaid card. Circle No. 164

Man-Made Diamond Abrasive Wheels

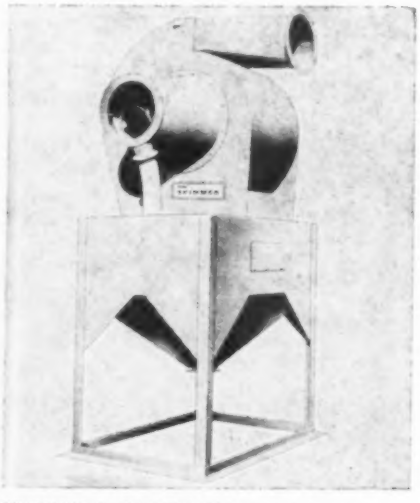
After two years of laboratory and field testing, man-made diamond abrasive wheels and hones are now added to the firm's regular diamond abrasive line.

Designated MD for man-made diamonds, the resin-bonded wheels are available in 100 and finer grits and in 25, 50, 75 and 100 concentration. Metal and vitrified bond MD wheels are made in selected concentrations in the same range of grit sizes.

Following the General Electric Co.'s successful manufacture of diamonds, Carborundum engineers collaborated with G.E. in exhaustive tests of their use in grinding wheels. Proved in tests, man-made diamonds now supplement natural diamonds for grinding carbides and other applications requiring the unusual grinding properties of the diamond.

The Carborundum Co., Bonded Abrasives Div., Niagara Falls, N.Y.

Use postpaid card. Circle No. 165



CENTRIFUG..L PRECIPITATOR. The Skimmer is a low-pressure-drop unit used for primary dust collectors in pneumatic conveying, and where atmospheric pollution will not be created. It is available in 13 sizes capable of handling air volumes from 600 to 40,000 cfm with great efficiency. American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.

Use postpaid card. Circle No. 166

Large Capacity Profile Grinder

With its 6" diameter wheel, the No. 2 profile grinder is said to finish large dies and other similar contour grinding operations with the efficiency of smaller wheel models.

The new size is made in the single spindle model, with a bigger table to accommodate larger work. It is also available with the standard upper spindle. The grinder can also be used with the Boyar-Schultz dust collector.

Boyar-Schultz Corp., 2000 S. 25th Ave., Broadview, Ill.

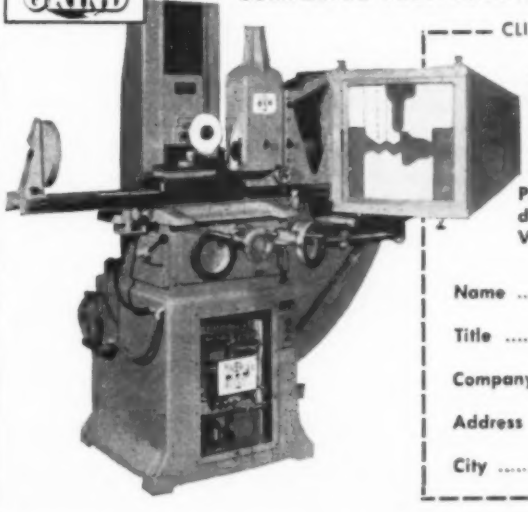
Use postpaid card. Circle No. 167

Do you have any kinks which would be helpful to the next fellow? Send them to GRINDING and FINISHING for publication. All material is paid for! Material can be in your own words, drawings can be rough pencil sketches; our editorial and art departments will do the rest. Send your Hints and Kinks to: Editor, GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.

ARE YOU CONTOUR GRINDING PUNCH and DIE SECTIONS?....

FREE "VISUAL GRIND" BOOKLET SOLVES YOUR PROBLEMS: IMPORTANT TO YOU. Free booklet tells how VISUAL GRIND facilitates contour grinding of carbide or steel, punch and die sections, dies for powder metallurgy, lamination dies and special purpose dies. VISUAL GRIND permits through, blind and templet grinding . . . permits continuous inspection by magnifying work from 10:1 to 100:1 . . . upgrades semi-skilled labor . . . permits easy maintenance of dies in your own plant . . . reduces costly down time. VISUAL GRIND COMPLETES YOUR TOOL ROOM.

VISUAL GRIND



CLIP and MAIL THIS COUPON

THE CLEVELAND GRINDING MACHINE COMPANY

1660 Eddy Road • Cleveland 12, Ohio

Please send me the free brochure describing the capabilities of VISUAL GRIND.

Name .....

Title .....

Company .....

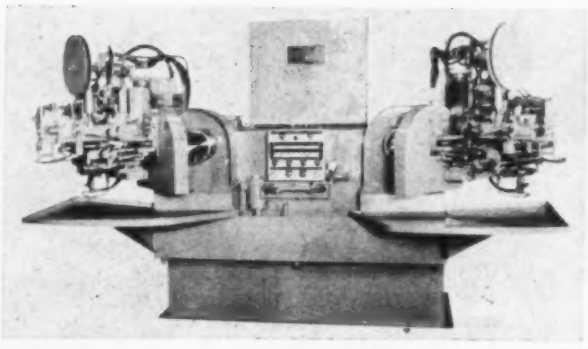
Address .....

City ..... State .....

Polishing Machine

The Hi-Lite Model SBSR 12" double spindle automatic sunray machine produces Sunray finishes on the inside of items having a general minimum diameter of 5½", to a maximum diameter of 12".

Two vacuum chucks are used to hold the items. Operator loads one side while the other is going through its automatic cycle. Coated abrasive used is 1" wide and automatically indexed off 50 yard rolls.



Use postpaid card. Circle No. 109

Hi-Lite Polishing Machine Co., Inc., Rt. 2, No. 44th St., Sheboygan, Wis.

Vibration Analyzer Is Three Instruments in One

The IRD Model 311 vibration analyzer features a meter which presents the peak-to-peak displacement in three ranges of 10 mils, 1 mil and .1 mil. A variable frequency filter is provided to permit a separate analysis of each frequency from 500 cpm to 5000 cpm.

A vibration analyzer, a portable in-place balancer, and a system to monitor

vibration in machinery, all in one, it reduces machinery wear, poor machine performance, and chatter.

It is designed to be used on machine tools, motors, power transmission systems, etc., such as employed in the power, transportation, metalworking, and other industries.

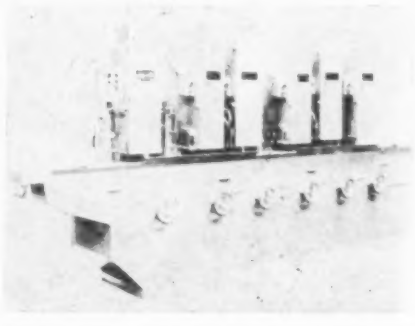
International Research and Development Corp., Box 55, Worthington, Ohio.

Use postpaid card. Circle No. 110

Grinder Combines Six Operations in One

The conveyor-type abrasive belt machine makes possible six grinding operations in a single conveyorized pass. Designed for high-volume flat surfacing of ferrous and non-ferrous metals, and other materials, Model No. 680-6 is equipped with six individually-adjustable grinding heads. It can be used for both wet- and dry-belt grinding.

By using a series of progressively finer grit abrasive belts, unmachined parts can be rough-ground, precision-sized, and machined to a fine, micro-inch finish in one continuous operation.



The grinder has a maximum piece capacity of 5" high, 5½" wide, any length. Models are also available with 8", 10" and 12"-wide abrasive belts.

Engelberg Huller Co., 831 W. Fayette St., Syracuse 4, N.Y.

Use postpaid card. Circle No. 111

AMERICAN LIP CORPORATION

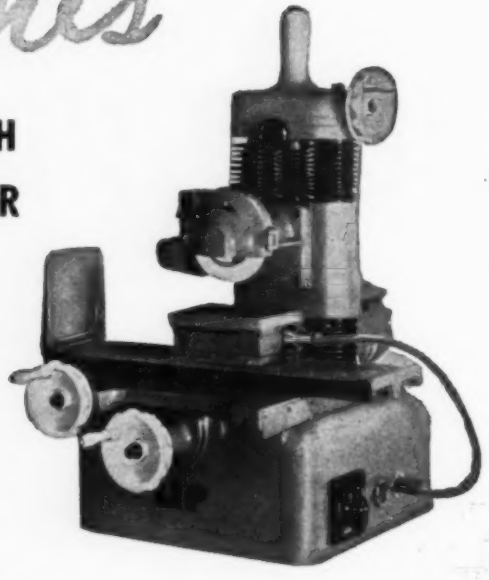
Presents

PRECISION BENCH SURFACE GRINDER

★ **EFFICIENT**

★ **ACCURATE**

★ **VERSATILE**



This compactly designed surface grinder is especially adapted for the precision dry grinding of small parts: dies, tools, gauges and instrument components. The low-cost LIP surface grinder permits the spot use of a number of machines strategically located throughout the plant. Features: Automatic spindle play take-up; precision ball bearings, counter balanced grinding wheel, bellows for dust protection, built in demagnetizer; magnetic chuck surface, 4⅛"x6"; longitudinal stroke of table, 8"; cross stroke, 4¼". Grinder is supplied complete with a 1/3 H. P. 220 volt or 110 volt ball bearing motor.

Representatives note: Several Exclusive Territories Available.

FOR LITERATURE AND PRICES WRITE TO:

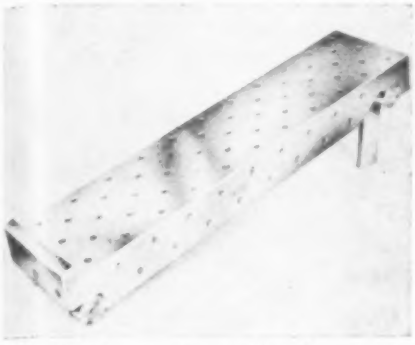
AMERICAN LIP CORPORATION

Tel.: Circle 6-0088

610 Fifth Ave. New York 20, N. Y.

20" Sine Block Gives Toolmakers Greater Range

A 20" sine block, Model 9118-20, for toolmaker's use in checking and measuring larger work, combines the features of a 20" sine bar with a right angle



iron. Work may be easily clamped to block by using tapped holes which are available on all working surfaces. Sine plugs, ¾" in dia., provide a line contact wherever desired throughout their 2⅛" length.

Tolerances and specs. include: Top surface ground parallel within 0.0001" to the center line of sine plugs. Sine plugs are identical diameters located 5.000 ± 0.0002" from center to center.

Taft-Peirce Mfg. Co., Woonsocket, R.I.

Use postpaid card. Circle No. 112

Mist Coolant System for Drill Grinders

Grinding wheel life is reported to be tripled on Black Diamond and Worcester drill grinders with the addition of a mist coolant system.

The Spraymist unit is available as a separate package for mounting on all existing grinders, or as an optional extra on new models.

The system directs a jet of cool mist at the grinding contact point. Cooler grinding eliminates the need for frequent wheel dressing, and also prevents drill burning. A faster cut and finer finish is reported, with grinding dust held down.

Black Diamond Saw & Machine Works, 121 North Ave., Natick, Mass.

Use postpaid card. Circle No. 113

Air Gage Meter With Remote Pressure Regulator

Great air gaging economy and flexibility has been made possible with the Federal Dimensionair air gage meter, with remote pressure regulation and filtering. Since the air gage meter incorporates a fixed magnification system, the filtering and regulating elements of the gage are not called upon to perform the added function of setting gage magnification. This enables these elements to be separated physically from the metering portion of the gage, with one regulator-filter serving up to five meter units.

Meter units may be relocated easily since they are connected by a five-foot hose to the centrally located regulator. The small size meters are ideal for mounting directly on machine tools where space is at a premium.

Federal Products Corp., 1144 Eddy St., Providence, R.I.

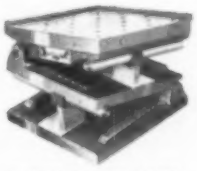
Use postpaid card. Circle No. 114

New!

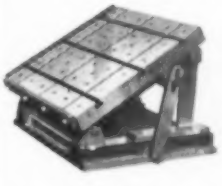
"MAGNA-SINE" WITH MAGNETIC TABLE

Robbins features for NEW SPEED, ACCURACY, SAVINGS ... on every angular SET-UP!

These exclusive new features make Robbins angular tooling equipment *even more* valuable to every shop, large or small: (1) NEW O. S. Walker Multi-Pole Fine Division Permanent Magnet Chuck . . . the most powerful ever built! (2) NEW ribbing in base, intermediate and top plates for distortion-free strength and rigidity! (3) NEW "Perma-Flat" Swivel Block keeps gage blocks securely in place! (4) NEW full-length roll bar radius ground from solid for positive seating, greater accuracy! (5) NEW Robbins positive locking device! Add to these the proven Robbins design principle which makes setting up to machine, grind or inspect any angle a simple, four-step job that takes minutes instead of hours . . . and you see why every shop needs these tools. Free demonstration on your job.



INSPECTION AND LIGHT MACHINING SINE PLATE



HEAVY DUTY SINE PLATE FOR MACHINING

NEW! Catalog shows complete range of models and sizes. Write for your free copy.

OMER E. Robbins COMPANY
11961 DIXIE AVENUE DEPT. K DETROIT 39, MICH.

Milling Attachment

Model M attachment is designed for mounting on lathes, milling machines, turret lathes, planers, boring mills, as original equipment on special machines, etc., and for types of work as keyseating, milling, slotting, drilling, etc.

Precision work can be performed on small or large parts. Six different speeds range from 200 to 900 rpm. Spindle height is 2" and capacity is 1" end mill. The machine is priced at only $245.00 fob, Clinton, Mo.

Alva Allen Industries, Clinton, Mo.

Use postpaid card. Circle No. 115

D1-S Grinder on radial drill grinding hard spot on bearing seat.

here's the way to cut costs in hole grinding

...even when needed only a few times per year!

With the Onsrud D1-S Hole Grinder you can do precision grinding in your own shop. Designed for mounting on lathe, milling machine, jig borer or drill. Air turbine motor drive gives ¼ HP, 50,000 RPM grinding speed. A precision built unit throughout with vernier scale for adjustment to 0.0001". For grinding holes up to 2¾" diameter . . . or up to 4" with adapter plate. With the D1-S you can do precision hole grinding in your own shop . . . and control quality to your own standards at considerably lower cost. Experience shows it pays for itself, even when used only a few times a year. For complete information write for Bulletin 1126.

ONSRUD
MACHINE WORKS, INC.
PORTABLE TOOL DIVISION
7736 Lehigh Ave., Niles 31, Illinois

Portable Polishing Head

The Bantam Model SH-1050, 12 brush portable Vonnegut head is found to be a solution to problems of deburring, blending, polishing, cleaning up of surface discoloration, and the development of decorative finishes where the workpiece is too large or heavy for convenient handling.

The model is mounted on an air motor in the illustration, and the total combined weight is only 3½ lbs. It can be purchased with a choice of interchangeable adaptors for various popular spindle sizes, or male stud for chuck mounting.

Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, Ind.

Use postpaid card. Circle No. 116

Diamond Lapping Compound

An improvement in the formulation of a diamond lapping compound is reported 1.7 times, by actual test, as economical as diamond powder, according to the firm. This is made possible by the development of a water dispersible vehicle which has increased the adhesion of the compound to the workpiece. This is especially necessary when fast rotation laps are employed. The compound is for use on lapping and polishing operations on carbide, sapphire, steel, and other hard materials.

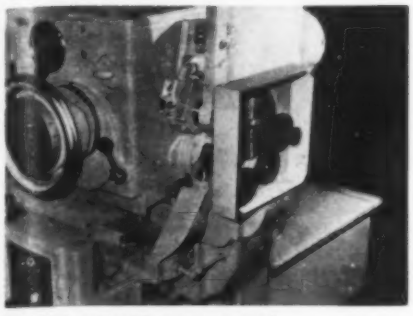
The compound is able to disperse in water. With it used diamond powder can be more easily salvaged. On dissolution of the paste with water, the diamond powder, along with the abraded metallic particles, can be collected quickly and the valuable diamond powder salvaged.

The compound is available in cartridge for use with applicator gun (as illustrated), as well as tubes and jars.

Diamond Dust Co., Inc., 88-19 76th Ave., Glendale 27, L.I., N.Y.

Use postpaid card. Circle No. 117

Centerless Grinding Machines With Improved Features



Vari-pitch unit with cover removed.

Cincinnati's precision grinding machines (Nos. 2 and 3), rated at 15 hp and 25 hp respectively, have been greatly improved.

Grinding wheel truing controls are now located at the left-hand end of the bed for improved convenience of operation. The bed is 5" longer, to provide a greater area of support for grinding wheel truing units. Greater throat capacity accommodates larger regulating wheels (13" dia. vs. 12"). For manual infeed with automatic hydraulic ejector, the infeed lever can be moved through a partial arc, while still retaining the advantage of automatic ejection of the work. The workrest pad is now machined with a parallel slot, to facilitate alignment of the workrest blade with a dial indicator. Time-tested features as Filmatic grinding wheel spindle bearings and anti-friction wheelhead slide have been retained.

A greater selection of accessory equipment is now available. One is the vari-pitch unit for hand infeed grinding equipment. Through a simple change gear arrangement, the operator has a choice of three throat openings between the wheels for loading and unloading the work.

A precision indicator attachment for rapid, visual taper correction is also obtainable. The unit, mounted on front of the machine near the swivel adjusting screws, is employed for accurate infeed operations.

Automatic grinding wheel balancing can be obtained as a built-in feature. The mechanism is lever operated. When unclamped, three steel balls in the wheel end of the spindle rotate freely, and correct any out-of-balance which may exist. Unclamping, balancing and reclamping require but a few seconds.

In addition, a new attachment is available for endwise adjustment of the grinding wheel spindle up to 3/16" forward or back.

Cincinnati Grinders, Inc., Cincinnati 9, Ohio.

Use postpaid card. Circle No. 118

Automatic Cycling For Precision Surface Grinders

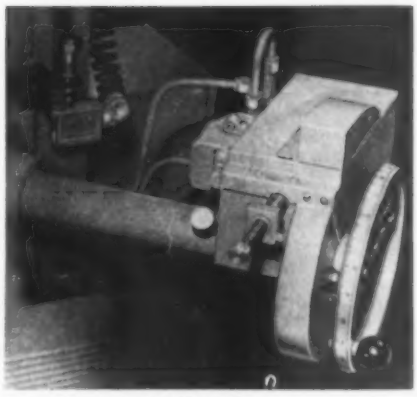
Complete automatic cycling equipment for the line of hydraulic powered hydrabrasive precision surface grinders has been introduced. Work can now be ground to size without operator attention. Flats, slots, shoulders and shapes now can be ground automatically to close tolerances.

By setting the automatic down-feed to actuate either on the table reversal or saddle reversal, the equipment will operate to pre-set tolerances. Depending on the precision finish required, the unit can be set for either 1, 2 or 3 spark-out passes before automatically shutting off.

The automatic down-feed is set with an infinite increment adjustment of from .0001" to .0025" on the elevating handwheel. This adjustment can be varied while the machine is running. As extra equipment, a special control is available which—at the push of a button—makes the head down-feed the amount pre-set.

Abrasive Machine Tool Co., Dexter Rd., East Providence, R.I.

Use postpaid card. Circle No. 119

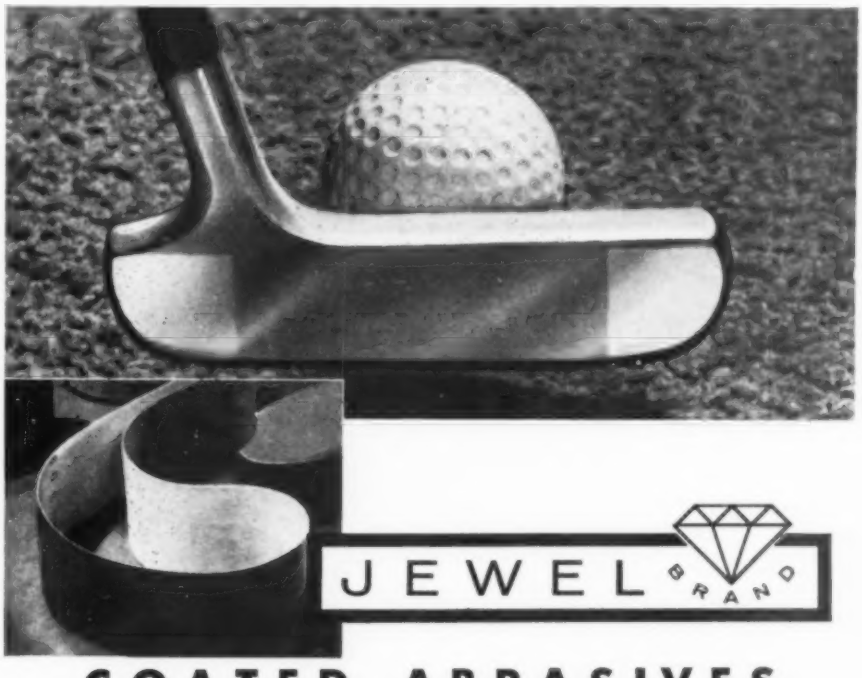


Testing Method for Magnetic Chucks

The testing arrangement shown is designed by O. S. Walker Co. engineers to record the load required to slip a steel block of prescribed dimension. This is to prevent chuck failure which often occurs when material slides on the chuck bed rather than being pulled from it. A Dillon mechanical force gauge

For the finishing touch that means so much!

Whether you're polishing the business end of a stainless steel golf club or smoothing out the rough spots in precision instrument parts, Jewel Brand Coated Abrasives ensure faster, finer finishing. On job after job, experience proves that **end products cost less when you finish with Jewel Brand Abrasives.** Prove it for yourself now, by bringing their many money-saving advantages to bear on your own finishing problems. Order from your Industrial Distributor or write for specific recommendations. Abrasive Products, Inc., 517 Pearl Street, South Braintree 85, Mass.

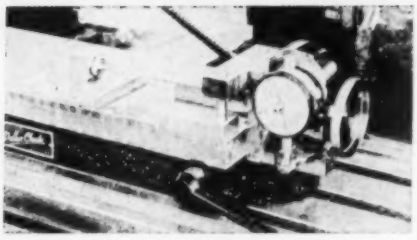


COATED ABRASIVES

Belts • Rolls • Sheets • Discs • Specialties

ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts



with maximum pointer is incorporated to facilitate this reading.

As the hand wheel is rotated, pressure is exerted on the test block gradually increasing until the block begins to slide. This force is accurately indicated by the maximum pointer of the force gauge.

Ratings upwards of 200 lbs. before slippage have been exerted by this testing setup. The gauge illustrated will check loads between zero and 250 lbs.; other capacities are made to check to 50,000 lbs.

W. C. Dillon & Co., P.O. Box 3008, 14620 Keswick St., Van Nuys, Calif.

Use postpaid card. Circle No. 120

Wet or Dry Abrasive Cutting Unit

The restriction of movement forward and back over a limited arc, in cutting, has been circumvented by the See-Saw. It travels over a prescribed distance steadily, or intermittently, if desired.

The machine is powered by three separate motors: One rotates the cutting wheel and is always functioning during a cut; a second powers the forward and back travel of the cutting head, and a third motor supplies more than 35 gallons of cutting compound to the cutting area.

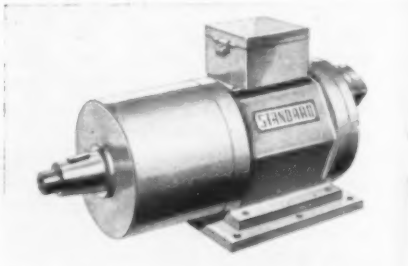
Cutting is anywhere in a 9" x 18" area, and the unit can cut wet with rubber bonded wheels or dry with resinoid bonded wheels.

Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago 14, Ill.

Use postpaid card. Circle No. 121

Precision Spindles for Metal Removal

Super precision spindles, motorized or independent drive, are now available to handle 1000 amps. The illustration is the latest design of a 5 hp, 1800/3600 rpm with slip ring and isolation



for 1000 amps and suitable for 3000 amps in the process of electrolytic metal removal.

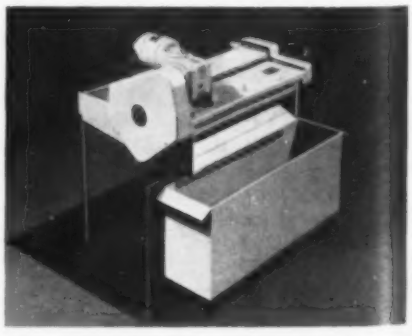
The spindle nose will serve a variety of wheel holders for straight or recessed wheels. Other models are available for 75, 100 and 350 amps.

The Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, Ohio.

Use postpaid card. Circle No. 122

Magnetic Coolant Separators

The simplicity of the operating principle of the Power-Grip magnetic coolant separators makes it possible for a unit small in size to clean a relatively high volume of fluid. The separators offer completely automatic coolant

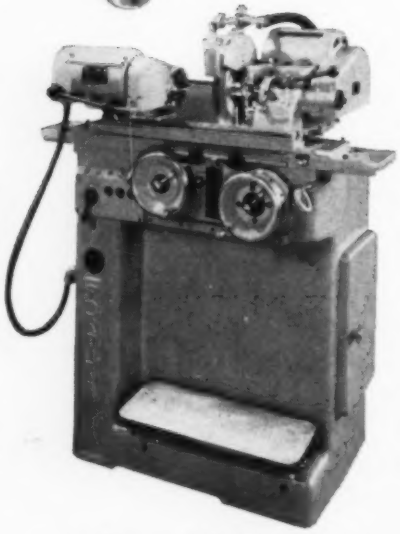


cleaning and can be easily installed on numerous types of grinding, honing, and gear-shaving machines. Coolant leaving the machine passes under the

Precision Grind Small Parts On A *Fortuna*

The Fortuna 200 series of cylindrical grinding machines provides accurate, dependable grinding of a wide variety of small parts—injection needles, servo valves, watch parts, or wherever highest accuracy is required. Parts can be ground between centers, with high-precision collets, in chucks, or on face plates.

With a Fortuna even unskilled operators can obtain extremely fine limits of accuracy—as close as .00002" (twenty millionths).



A Fortuna UME 200 Universal Cylindrical Grinding Machine

IME 200—For internal grinding.

RME 200—For external grinding.

UME 200—For universal grinding—with double-swivel grinding head if desired.

Also available—all types of precision internal grinding spindles—including high frequency spindles up to 180,000 r.p.m.

Write For Additional Information

COSA — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

permanently charged Alnico magnet revolving drum for exposure to the magnetic drum without interference from nonmagnetic insulators.

Longer tool life and improved product quality are claimed. Continuous operation with minimum attention is assured because the separator is said not to clog or require shutdowns for sludge removal.

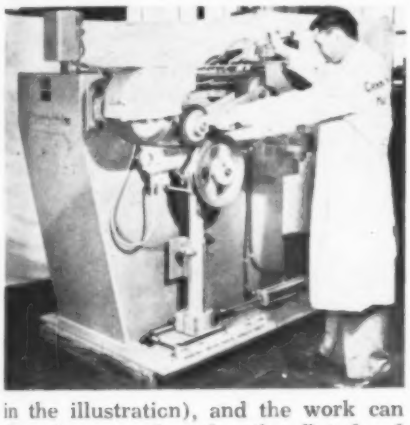
The units are available in one, two, three, and four drum types in 25, 50, 75, and 100 gpm capacities.

Sundstrand Machine Tool Co., 2531 Eleventh St., Rockford, Ill.

Use postpaid card. Circle No. 123

Sheave Grinder

A sheave grinder has been added to the manufacturer's line of abrasive-belt equipment. Both the throat and the O.D. of the sheaves, from 10" to 42", may be ground on the machine by the use of the abrasive belt. A formed contact wheel grinds the groove (as shown



in the illustration), and the work can then be moved under the flat faced contact wheel for grinding the O.D.

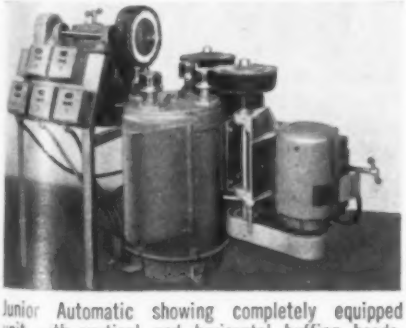
Interchangeable contact wheels and extra adapters make it possible to accommodate various sizes of sheaves. The smooth finish produced makes a more satisfactory sheave, and the speed and uniformity of the grind increases production and reduces costs, according to the firm. Horsepower ranges from 5 to 10 and variable speed drives are available.

Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, Ind.

Use postpaid card. Circle No. 124

Small Size Automatic Polishing Equipment

The Junior Automatic, added to the manufacturer's line of polishing and buffing equipment, consists of a basic dial table with four powered work spindles, and optional manual or automatic indexing with adjustable dwell.



Junior Automatic showing completely equipped unit with vertical and horizontal buffing heads.

Polishing heads are obtainable in a choice of standard horizontal, vertical or angled buffing wheels; also available are continuous abrasive belt attachments.

The firm claims the unit is ideal for small shops because of low cost, simple installation, and compact size. It is also capable of handling full, heavy production if desired.

Murray-Way Corp., Birmingham, Mich.

Use postpaid card. Circle No. 125

Infinitely Variable Speed Buffers and Polishers

Maintaining peripheral speed throughout wheel life is claimed possible on the infinitely variable speed buffers and polishers. The machines feature a variable speed range of 1500 rpm to 3000 rpm, and other speed ranges are also available.

Instant spindle speed changes through a hand-wheel provides the correct surface speed for buffing, polishing, wire brushing, etc. The hand-wheel is calibrated and immediately registers the adjusted spindle speed. The simplicity of belt renewal and the choice of either open or enclosed spindles are additional features.

The Cincinnati Electrical Tool Co., 375 Mt. Hope Ave., Cincinnati 4, Ohio.

Use postpaid card. Circle No. 126

BREAK THE "PROFIT SQUEEZE" WITH BRIGHTBOY

Improve Your Product at Lower Cost

The unique working action of multi-use Brightboy (*abrasive and rubber functioning simultaneously*) produces a finish that frequently constitutes the final polish.

Brightboy is a STOCK line, made in a wide range of Silicon Carbide and Aluminum Oxide grains. Each in grades from extra fine to extra coarse, in soft, firm and tough rubber binders. The compound is in the rubber. *No muss! No fuss!*

Brightboy numbers are JOB-MATCHED to your finishing requirements; often take the place of "special" compounds; prove their versatility on regular and special finishing.

A Brightboy finish frequently constitutes the final polish, without necessitating an extra operation.

Made in WHEELS, STICKS, RODS & BLOCKS for machine and manual applications. Ask your dealer to recommend the Brightboy numbers for your needs, and for the Brightboy catalog listing applications and machine speeds. Write for "Notes From The Brightboy Service Engineer," describing Brightboy applications and uses.

Write for FREE SAMPLE BRIGHTBOY HAND PIECE for quick-job cleaning

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Abrasive Society News

Expanded Program Adopted by ASA

The expanded progran. proposed at the quarterly meeting of the Board of Directors of the American Society for Abrasives held April 19-20, at Hotel Elysee, New York City, under the chairmanship of Ted O'Connell has been approved and adopted by the Society.

As outlined by John Y. Arnold, President of ASA, key points in the program include development of an Information Center and Library, establishment of Industry Awards and Citations, as well as the creation of a Speakers Bureau, Film Reference Library, Job Counseling Service, and the encouragement of Research Projects. The president reported increased interest in Society activities is being shown by the major users of abrasives, who are among the top companies in the United States.

A chapter has been granted to the Long Island Chapter No. 8. Two other Chapters have applied for charters, and as soon as their by-laws are approved, charters should be granted. These Chapters-in-formation are Hudson-Mohawk Chapter in the Albany-Troy area, and Western Massachusetts Chapter covering the counties of Berkshire, Franklin Hampshire, and Hampden in Massachusetts.

Plans are for the Board of Directors of the ASA to reconvene on Saturday, June 21, in Reading, Pa., for one day to review progress to date.

ASA Adds Eighth Chapter

A charter has been granted the Long Island members designating them as Long Island Chapter No. 8. Officers for the coming year are: Bert J. Kemper, President; Paul E. Frick, Vice-President; Joseph Urgo, Treasurer; and Herman Golden, Corresponding Secretary. Inquiries concerning activities of the Long Island Chapter should be directed to Herman Golden, 71 Lion Lane, Westbury, L.I., N.Y.

ASA Promotes Safety

All chapters of the American Society for Abrasives have been asked to devote a minimum of one meeting to a discussion and analysis of the new American Standard Safety Code for "The Use, Care, and Protection of Abrasive Wheels."

John Y. Arnold, President of the Society, in instructing the Chapter program chairman stated, "Only by considering new safety codes and what they mean to industry in terms of personal well-being, production, and personnel relations can we obtain a true estimate of their utility. . ."

* * *

New Jersey Chapter—Members and guests gathered on April 16 at the Blue Shutter Inn in Union for a meeting which included a talk on "Crush Grinding" by E. M. Hakanson, manager of the Machine Tool Division of the Sheffield Corp. Hakanson illustrated his discussion with a sound slide film on the "Crushtrue Process" and a motion picture on "Manufacturing and Measurement of Hydraulic Servo Valves" using the crushtrue process. A social was planned for Friday, May 16, at the Blue Shutter Inn.

* * *

Detroit Chapter—The April 24 meeting was devoted to "Man-Made Diamonds," and drew 340 members and guests to the Executive Conference Room of Ford Motor Co. in Dearborn, Mich. Four speakers—J. D. Kennedy and N. Mattews of Metallurgical Products Dept., General Electric Co., and J. W. Ripple and J. Mueller of Carborundum Co.—discussed the subject of industrial diamonds at length. Highlights of the discussion were that although man-made diamonds now cost $3.50 a carat as compared with $2.80 a carat for natural diamonds, it is anticipated that improved production techniques will lower prices rapidly.

Western Michigan Chapter—W. H. Baum of Cincinnati Milling Machine Co. talked on "Centerless Grinding" at the March 17 meeting. Officers of the Chapter elected were Ralph Ploughman, Chairman; Charles Hennesen, Vice-Chairman; Paul Starks, Secretary-Treasurer. Grand Rapids was picked as the site for the May meeting. Topic planned for this meeting is "Electrolytic Carbide Grinding."

* * *

Pittsburgh Chapter—Seventy people braved inclement weather to gather at the Park Schenley for the March 26 meeting. Following the business meeting, Ralph Merritt of the Norton Co. showed a film and led a discussion on "Grinding Wheel Safety," and Day of the Carborundum Co. gave a short talk on "Coated Abrasives." The Pittsburgh Chapter meets bi-monthly, with the next meeting scheduled for May.

* * *

Reading Chapter—The Valley Inn in Reading was the scene of the April 21 Chapter meeting. Members and guests heard M. J. Hermann of Precision Grinding Wheel Co., Inc. answer questions raised by the film, "Centerless Grinding Operations." At the next meeting, officers for the coming year are to be elected. C. Nagle, O. Bensing and N. Snader were appointed Nominating Committee with Nagle presiding.

* * *

Connecticut Chapter–Dinner was served at the April 28 meeting held at Wright's Steakhouse, Plainville. New officers for the coming year are: Robert Carpentier, President; Pat Pascucci, Vice-President; Bert Broekhuysen, Recording-Secretary; Warren Hessels, Corresponding Secretary; William Greer, Treasurer. The next meeting, on May 26, open to members only, will be a tour of the New Departure Plant at Meridan.

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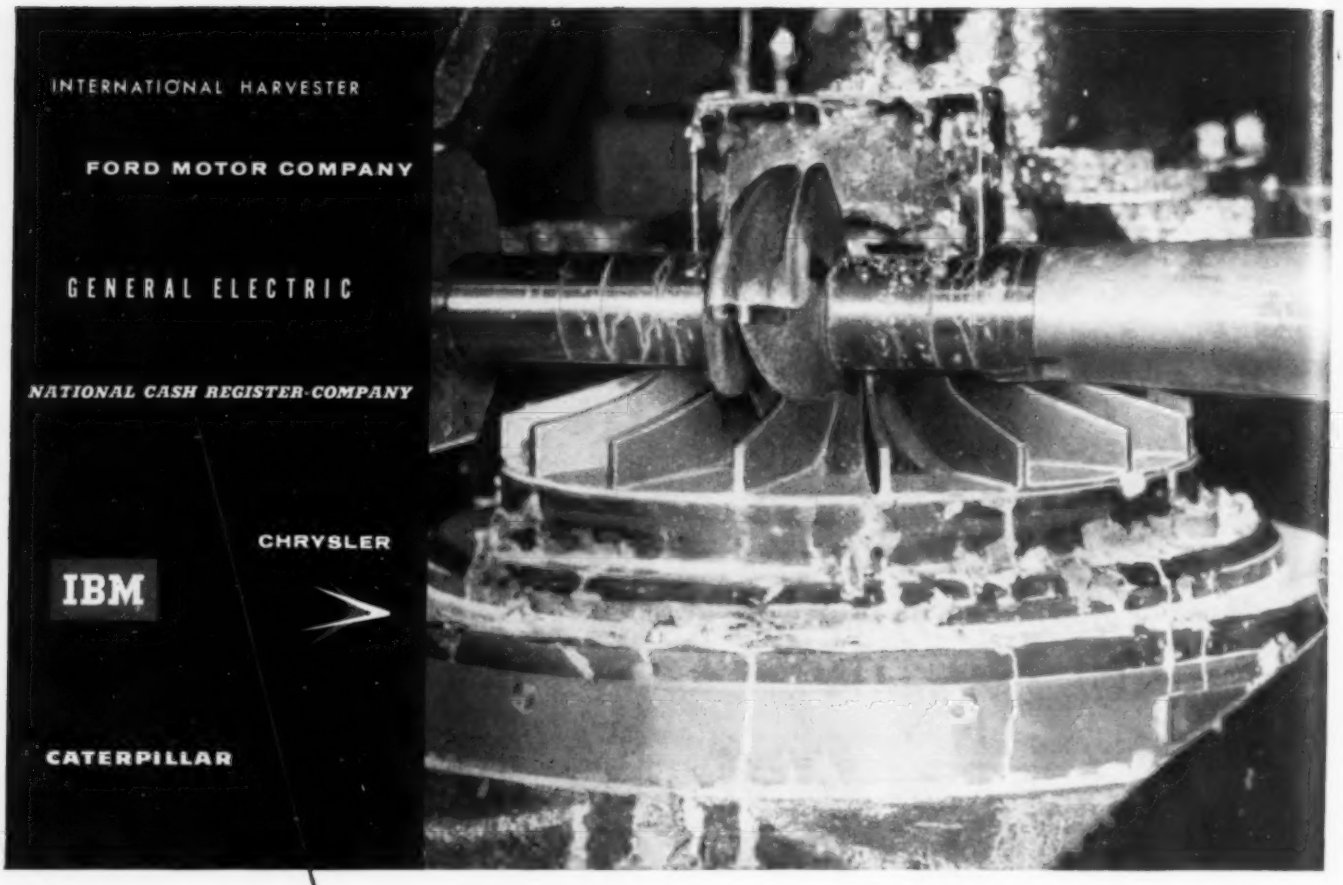

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News of Industry

Dividing Head for Measurements Involving the Arc

Two 12" opposing indexing heads and an arm extending 12" to the indicating point are employed here to form a 24" arc in a positive, double-checking setup to demonstrate accuracy of newly-developed indexing principle. Note position of indicator point, inscribed left; reading at right, and the instrument reading (in millionths) lower left.

Embodied in a newly-developed dividing head, the principle, for the first time, breaks down the arc accurately to within fractions of a second. It does this consistently and repeatedly in less than a minute.

Michigan Tool Co., Detroit, who will act as the exclusive sales outlet for the indexing head, and checked it out on an interferometer, says the development obtains its fractional accuracies through a concept that consists of hundreds of angular-phase mating surfaces, making contact at each one of the 360° settings with an equal number of the meticulously accurate mating surfaces. Thus, each time the head is indexed, accuracy is assured, not by one or two mating surfaces, but by hundreds.

The AA Gage Company has set up an in-plant demonstration unit on the indexing principle, which includes two 12" diameter tables—one atop the other. The top table has a 12" arm extending from its center (providing a 24" diameter check) to a fixture holding a jeweled contact point which, in turn, is connected to an electronic dial indicator graduated into millionths of an inch.

In demonstrating, company engineers bring the extension arm around to the jeweled contact point, and then set the indicator needle at zero on the dial. Next, the lower table is turned, counter-clockwise—say 25°. The top table is then rotated clockwise 25° so that the extension arm is returned to its original position touching the contact point.

In repeated cross-checking tests of this type, the electronic indicator dial has shown a deviation of not more than 12 millionths of an inch between the two dividing heads, which is the equivalent of 1/10 of a second accuracy.

Although the dividing head is a valuable laboratory tool, for quality control operations, it is particularly adaptable in production inspections—for boring operations, jig grinding, hole layouts and in locating slots and serrations.

AA Gage Co., 350 Fair St., Detroit 20, Mich.

Industry Should Make Use of Man-Made Diamonds

Speaking before the Detroit chapter of the American Society for Abrasives, John D. Kennedy, head of the diamond section of GE's Metallurgical Products Dept., Detroit, stated U. S. industry is not ready to make use of man-made diamonds. He urged manufacturers to begin research programs designed to fully exploit the potential of industrial diamonds.

Kennedy revealed that "production technology and capacity for production of man-made industrial diamond abrasive has caught up with application technology and other sizes should be available as industry requires them."

The Metallurgical Products Dept. sold its first small quantities of man-made diamonds in January, 1957, at $5.10 per carat. The cost is now lowered to $3.48.

"Some 70% of the diamond bort is used for the grinding of cemented carbides. Another 15% goes into diamond saws chiefly used in cutting stone and concrete. Eighty-five per cent of the raw diamond abrasive consumed goes into two relatively limited areas of application."

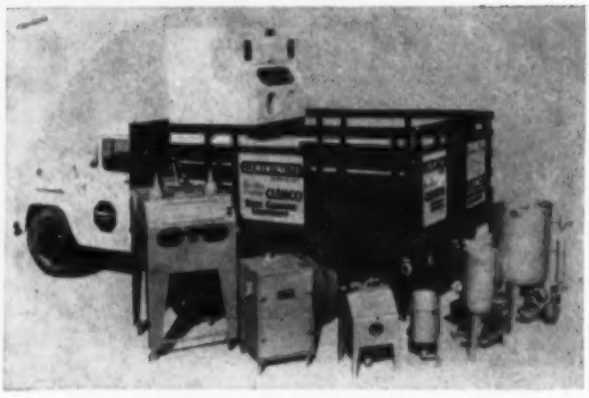
He raised the question of whether steels could be economically ground with diamond, particularly the hardened tool steel, also super jet alloys.

Traveling Display of Sandblasting Equipment

The Clemco traveling display of blast cleaning equipment is on the road. The show is designed to educate distributor personnel in new equipment used in sandblasting, and lectures will be given on the latest methods of surface preparation.

The unit will travel 20,000 miles exhibiting in all major marketing areas. Equipment as the Pulsair gun, the Torno-Blast, and the Wet Hone, will be operated.

Those interested should contact Clementina Ltd., 2277 Jerrold Ave., San Francisco, Calif.



Recession Benefit to Be Increase in Products

The president of Latrobe Steel Co., M. W. Saxman, predicted the country will find it has gained at least one positive benefit from the recession, "because there has been a marked increase in product development and improvement."

He further stated most companies have put more stress than usual on constant improvement of products in order to maintain a competitive edge. "Looking at the entire manufacturing industry of the United States, we see this as one positive benefit of slower business times. The impact of the jet age spurred developments in all lines of high quality metals," he added.

Vanguard Rocket Cone Featured in "Mine to Missile" Exhibit

The Industrial Diamond Association's "Mine to Missile" exhibit at the American Society of Tool Engineers' Show, May 1-8 at Philadelphia, scored a hit with the thousands attending the show.

The exhibit featured over a million dollars' worth of diamonds and diamond tools. A mound of diamonds as they are found in a typical run-of-mine production, a mound of uncut, unpolished gem stones, and mounds of various industrial stones were on display, as well as diamond tools and products in a wide range of types.

Highlighting the exhibit was the actual 7' phenolic asbestos nose cone of the Navy's Vanguard rocket. Diamond tools were used extensively in the production of the rocket.

Reference to the exhibit was carried by the NBC network on Dave Garroway's morning show, Today, and the Jack Paar show in the evening.

Winners in $12,000 Education Awards

Twenty-two winners have been chosen for International Education Awards for 1957-58 in the $12,000 scholarship program sponsored by the American Society of Tool Engineers.

Harold E. Collins, ASTE president, pointed out that the 40,000-member Society annually presents ten International Education Awards of $700 each to outstanding engineering students in colleges and universities to aid in their third or fourth year of studies in tool, production, mechanical, or industrial engineering. This year, for the first time, twelve technical institute and junior college students also received awards of $400 each to further their second year studies.

Vacuum Stream Degassing System

Standard Steel Works, Burnham, Pa. a division of Baldwin-Lima-Hamilton Corp., has placed a contract with the Vacuum Equipment Division of F. J. Stokes Corp., Phila., for the design and construction of a new vacuum stream degassing system. The system will have two vacuum chambers, each capable of receiving a 15-ton pour into an ingot mold.

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Electro mechanical and hydraulic models produced by one of Europe's largest grinder manufacturers—completely universal with swinging internal grinding heads. 14" x 2" x 5" O.D. wheel with 3 H.P. and 18000 and 35000 I.D. spindles with 1½ H.P. Long conical adjustable plain bearings in both wheelhead and workhead with automatic pressure oil bath lubrication. All machines have automatic table traverse and infeeds.

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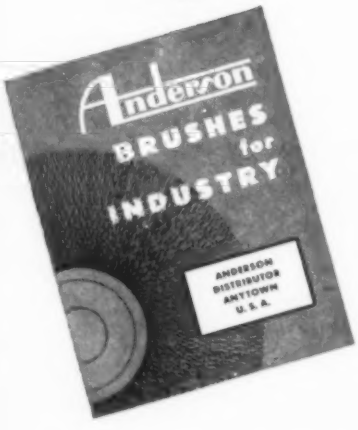

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The system, which accomplishes the refinement of steel in tonnage quantities by exposing the molten metal to the effects of a high vacuum as it is poured from the furnace into the ingot mold, will be an integral part of new melting and casting facilities now being built at Burnham. Also included is a 15-ton electric melting furnace.

The whole project is part of a $12,000,000 expansion and improvement program currently underway at Standard Steel, producers of castings and forgings in various shapes and sizes of carbon steel, stainless and high temperature alloys.

Brown & Sharpe Adds to Hydraulics Division

The hydraulic pump and fluid motor business of the Gerotor-May Company of Baltimore, Md., will become a part of the Hydraulics Division of the Brown & Sharpe Mfg. Co. of Providence, R. I.

Brown & Sharpe will now be in a position to provide completely engineered hydraulic circuits for the industrial field, built exclusively of components of its own manufacture. Applications for such equipment include vital controls for automated machine tools, mobile equipment, missile launchers, and many other installations of growing importance.

A recent series of acquisitions has added lines of hydraulic control valves and hydraulic power units to the firm's pump business. The Double A Products Co. of Manchester, Mich., a manufacturer of more than 1,000 different valve combinations, and the power unit portion of the Rosaen Co., Hazel Park, Mich., were purchased as part of the expansion program.

G. Harrison

E. C. Helmke

Gene Harrison, Chicago area Michigan Abrasive Co. representative, is now heading a new, completely staffed Chicago district office as District Manager. Located at 6261 W. Grand Ave., the office will serve the Chicago, Rockford, and Milwaukee territory.

Edward C. Helmke was recently appointed Chief Engineer of Gisholt Machine Co., Madison, Wis. He has served with the firm for 23 years, holding jobs as Sales Clerk, Draftsman, Assistant Service Manager, and more recently Assistant Chief Engineer.

Helmke recently authored the reference book, **Practical Dimensioning,** and several technical articles that have appeared in metalworking trade publications.

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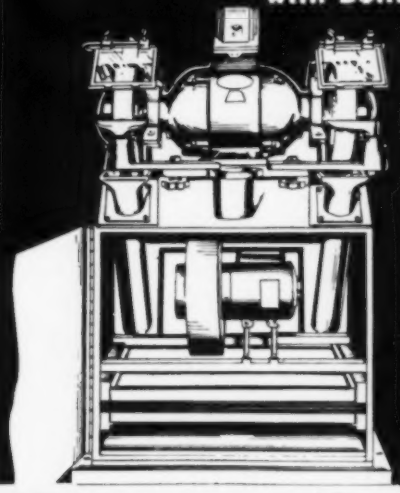
ARNOLD PALMER, winner of the Masters Golf Tournament at Augusta, Ga., is made a stockholder in leading Latrobe industries, by businessmen, industrial and civic leaders of the city. At a dinner and reception held in his honor at the Latrobe Country Club, "Arnie" Palmer is here presented with stocks by (left to right) H. S. Saxman, Vice-President-Finance and Secretary of Latrobe Steel Co.; P. J. Gill, President, Vanadium-Alloys Steel Co.; Palmer; M. W. Saxman, President, Latrobe Steel Co.; G. F. Neely, Vice-President, Vulcan Mold Co.

Metallurgical Products Dept. Adds Iron-Based Alloy to Line

J-1300, a precipitation hardening iron-based alloy, has been added to the vacuum-melted alloy line of the Metallurgical Products Dept. of General Electric Company, Detroit. The alloy, with excellent strength-to-weight properties, is especially effective in temperatures of 1300° to 1350° F.

The Casalbi Co., Jackson, Mich., announces the appointment of **E. S. Browning** for the California area. The Browning Co.'s main office is at San Francisco with an office also at Los Angeles. They will handle the complete Globe line of Casalbi's barrel finishing equipment and supplies. The Browning Co. has sold chemicals to various metal finishing users for twenty-seven years.

NEW 2-in-1 GENERAL PURPOSE GRINDER
with Built-in DUST COLLECTOR



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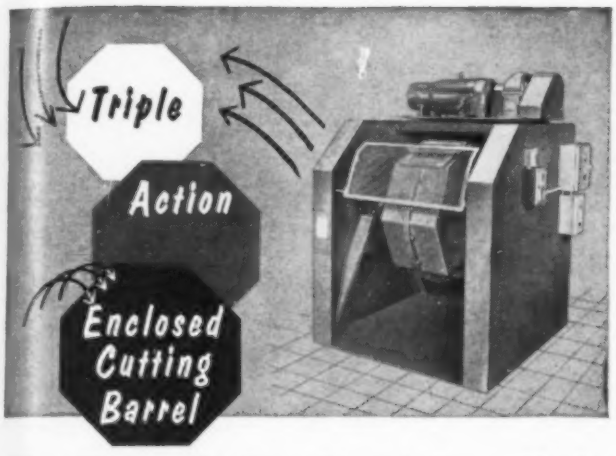

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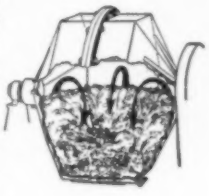

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Operating Pressure: 90-100 psi

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FIFTY YEAR AWARD was given to Leroy W. Thorne, Big Rapids, Mich., first Hanchett Mfg. Co. employee to receive this award, on April 21, 1958. Presentation was made by Kent S. Hanchett, President of Hanchett, of Big Rapids, Mich. and Portland, Ore.

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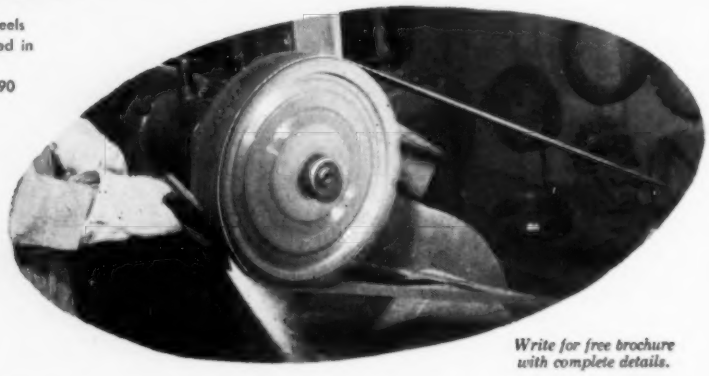

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New Officers at Besly-Welles Corp.

At the annual meeting of Besly-Welles Corp., held in Chicago on April 18, Edward K. Welles was elected Chairman of the Board of Directors and Chief

E. K. Welles, Sr.

W. C. Olson

Executive Officer of the company. Warren C. Olson, formerly Executive Vice-President, was elected President and Chief Administrative Officer.

After fifteen years in the banking business, Welles came with the firm in 1936 as Vice-President, and has served as President the past sixteen years. Olson, formerly with Price, Waterhouse & Co., came in 1942 as Controller. In 1949, he was elected Vice-President and Secretary; and in 1955, Executive Vice-President.

All other officers of the company were re-elected.

Bay State Elections

The Bay State Abrasive Products Co., Westboro, Mass., held their Annual Directors' Meeting, following the Stockholders' Meeting, at the company's Westboro executive offices.

Leonard M. Krull was moved from Chairman, Board of Directors to Honorary Chairman, Board of Directors. He was one of the three original founders of the firm.

O. S. Buckner

E. C. Hughes

Orello S. Buckner, formerly President is now Chairman, Board of Directors. **Earl C. Hughes** was Executive Vice-President and Secretary, but now President; **Arthur E. Gilman** was re-elected Treasurer and also elevated from Asst. Secretary to Secretary; **Elden L. Auker** was re-elected Vice-President, Charge of Marketing, and **Harold G. Clayton** was re-elected Vice-President, Charge of Manufacturing.

The complete slate of Directors for the ensuing year will be: **E. L. Auker, O. S. Buckner, H. G. Clayton, A. E. Gilman, E. C. Hughes, L. M. Krull, D. R. Porter,** Vice-President of David L. Babson & Co., and **D. B. Wilson,** Director of Engineering.

A. E. Gilman

J. J. McLoughlin

Joseph J. McLoughlin has the newly-created position of Market Research Manager for Taylor Fibre Co., Norristown, Pa., manufacturers of vulcanized fibre and laminated plastics. He previously was employed in the Market Research Dept. of AMP Inc., Harrisburg, Pa., and as a trade analyst by E. I. du Pont de Nemours Co., Inc., Wilmington, Del.

Leonard M. Kulze has been promoted to Factory Manager of Associated Spring Corp.'s Gibson Division in Chicago, and **Joseph A. Harinek** has been named Chief Engineer to succeed him. Both men have more than twenty years' experience in precision spring manufacturing, all of it with the Gibson Division.

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No. 3EZ Pangborn Hydro-Finish wet sand-blasting machine. Like new. Bargain.

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USE IT EITHER WAY

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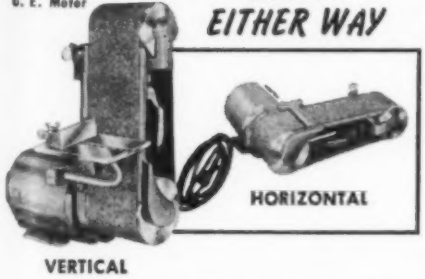

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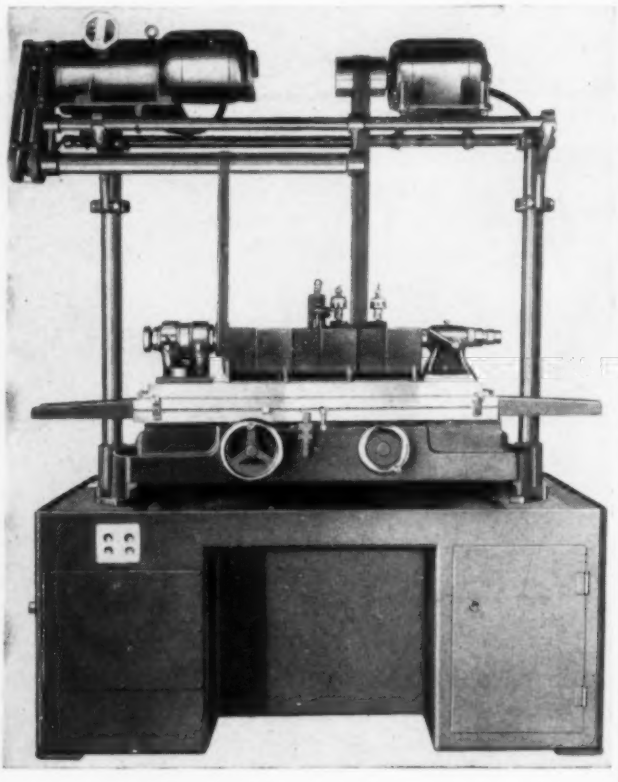

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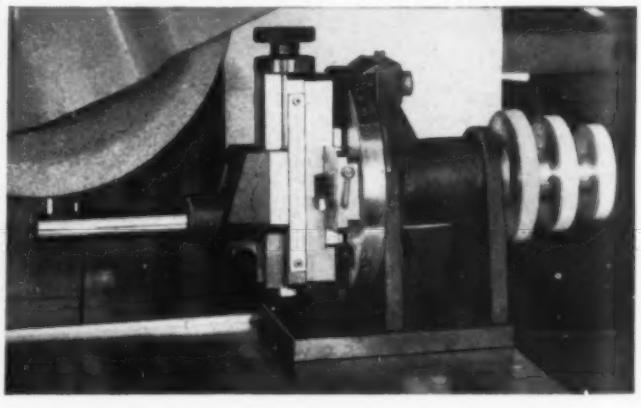

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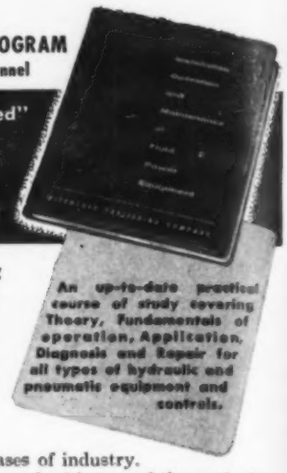
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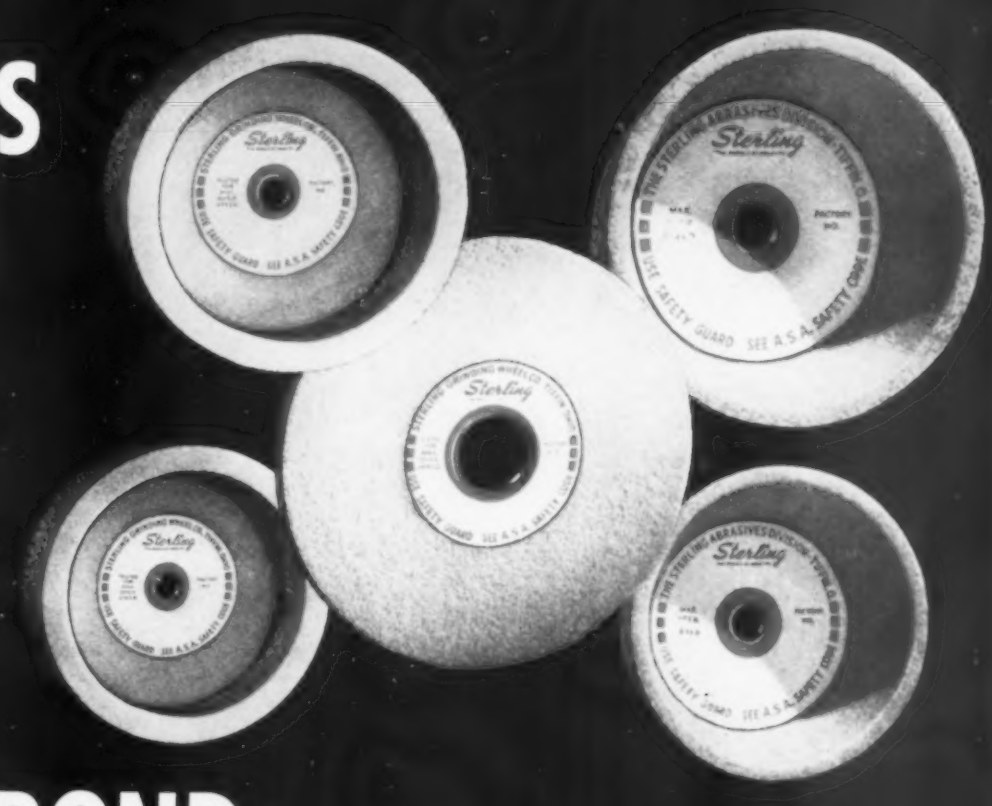

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Erickson Precision Expanding Mandrels Solve Grinding Problems

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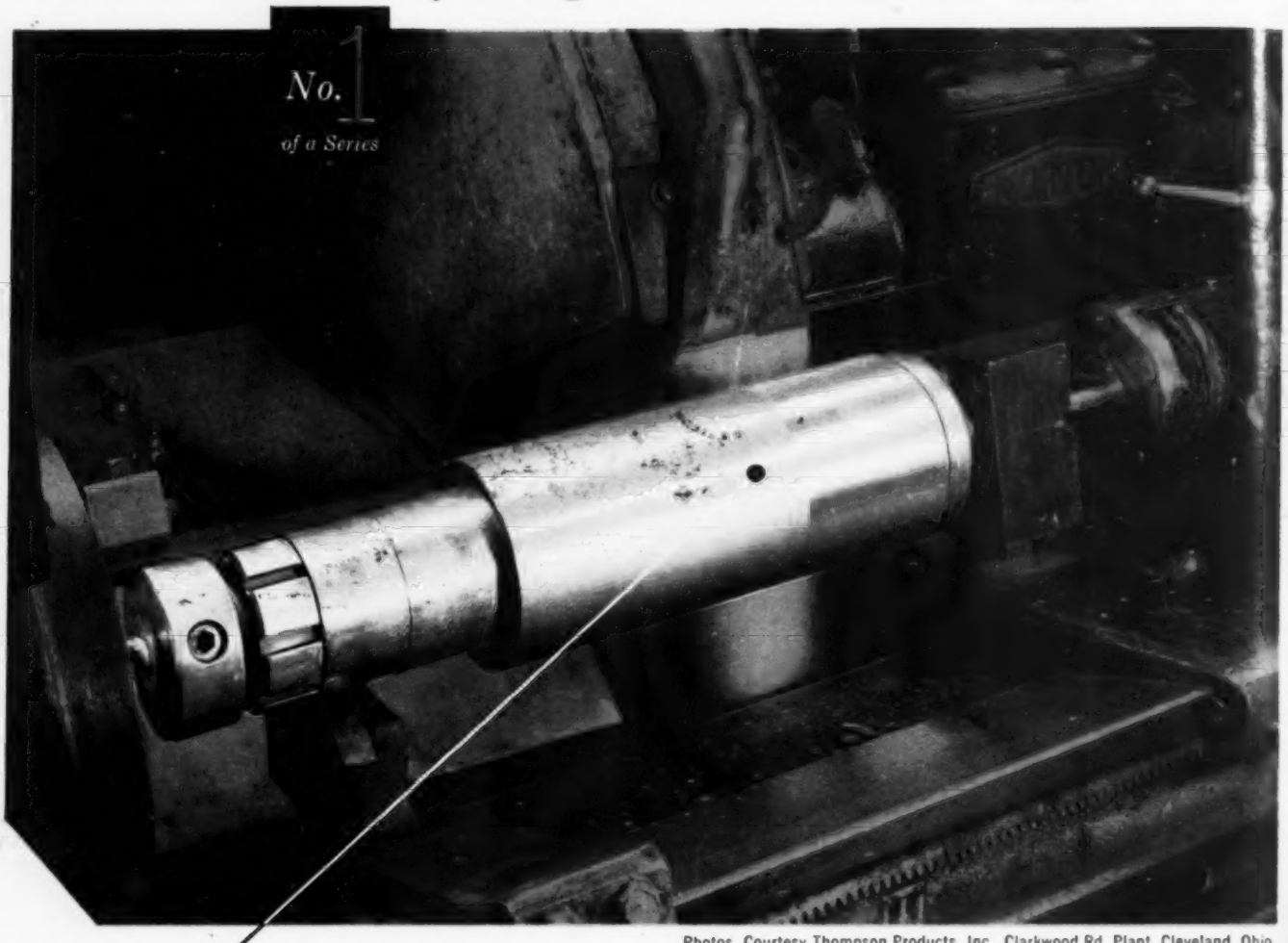

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e.g. engine cylinder liners

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Tap Chucks

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Expanding Mandrels
Special Holding Fixtures

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